COORDINATED HIGHWAYS ACTION RESPONSE TEAM
STATE HIGHWAY ADMINISTRATION

CHART Release 11
Detailed Design

Contract SHA-06-CHART
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By
CSC

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0	Initial Release	All	11/26/2012

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1 Introduction

1.1 Purpose

This document describes the design of the software for CHART Release 11. This build provides the following new features:

- **Participants/AVL:** CHART R11 adds the ability to define event resource types and event resources that can be added as participants in events. These event resources and types can be added to operations centers to make them available as participants for traffic events controlled by the center and traffic events managed by the center's users. Event resources can be associated with Automatic Vehicle Location (AVL) devices and the location information is used by the system (optionally) to automatically detect when an event resource is on the scene (or has departed the scene) of a traffic event. The system can also automatically detect when a specific resource arrives on the scene when a generic resource of that type was requested (for example if the user requested a dump truck and a specific dump truck arrives on the scene). The system will optionally replace the generic resource type with the specific resource when this occurs. The location information for an event resource is also used to help the user select participants to add to a traffic event by allowing the user to sort by distance from the event. CHART R11 allows annotations to be added to each participant assigned to a traffic event. This allows the user to identify the participant's radio call sign, driver name, and add miscellaneous notes about the participant. CHART R11 also allows users to track the in service and out of service status of field units and facilities, and allows AVL equipped event resources to be viewed on the home page map. Other usability enhancements exist as part of this feature:
    - An event resource can be associated with a camera, and links exist to allow the user to view the associated camera on the desktop (if supported) or to launch the form used to display the camera on a monitor.
    - Event lists show the number of participants assigned to events and allow the user to set a participant as notified, arrived/responded, and departed directly from the event list. The user can also launch the form used to add participants to the event directly from the event list. These enhancements save time for the user as the user is no longer required to view the event details page for these tasks.
    - When creating a traffic event, the user can select a specific field unit and that unit will be automatically be added as a notified participant in the newly created event.
- **Notification Enhancements:** CHART R11 enhances the form used to send notifications from the context of a traffic event. The feature that suggests the notification message content will be changed to remove participant information, provide a better description of lane closures, omit shoulders from the lane closure description, and to automatically include the word "updated" for notifications for a traffic event after the initial notification. A new shortcut drop down is added for "Facility" to allow shortcuts for facilities such as the Inter-County Connector (ICC) and Fort McHenry Tunnel (FMT) to be defined and used in notification messages. Other enhancements include requiring

users to enter their initials prior to sending a notification, making all shortcuts insert text at the current cursor location, and making consistent use of the phrase "Scene Clear".

- **Decision Support:** CHART R11 enhances decision support by helping the operator to determine the best HAR devices to use in response to a traffic event and to suggest messages that the operator should consider putting on the selected radios. To that end, the system can be pre-configured with message templates that pertain to one or more traffic event types and HARs within certain proximities. Upon request, the system finds the HARs near a traffic event (using further away devices as more lanes close) and then searches through the pre-configured templates looking for those that pertain to each HAR for the traffic event. The variables in the template are then replaced with current data from the traffic event to create the suggested message. Each HAR can have multiple suggested messages, so the system scores each message it creates from a template based on how specific the message content is (number of parameters, etc) and presents the suggestions with the highest scoring suggestion at the top. The traffic event response panel has been enhanced to notify the user when the current response plan does not contain a DMS or HAR that decision support rules indicate should be used. The preview response plan details map has been enhanced to show all response devices (both DMSs and HARs) and what messages they would have on them if the response plan was executed.

  In addition to HAR message suggestions, CHART R11 also adds the ability to filter loation aliases and device lists using areas of responsiblity. The list of location aliases available to the operator when setting an object location is initially filtered by the areas of responsibility associated with the user's operations center. The filter can be removed to view all location aliases in the system. If no areas of responsibility are associated with a user's operations center, the location aliases will not be filtered. Device lists are now also initially filtered using both the system folders and the areas of responsibility associated with the user's operations center. This filter can also be removed to view all devices in the system. If no areas of responsibility are associated with a user's operations center, the device lists will be filtered based on the system folders (unless no system folders exist either in which case all devices will be displayed).
- **Traffic Signal Integration:** This feature integrates Signal Shop data into CHART enabling users to associate traffic signals to Action Events. Traffic Signals from the Signal Shop database will be visible on the Home Page and Event Creation maps. Traffic Signals currently associated with Action Events will display as traffic signal icons (with red backgrounds) on all map zoom levels. Traffic Signals not currently associated with Action Events will display as traffic signal icons (with white backgrounds) but only on the lowest 2 map zoom levels. Users will also be able to use Traffic Signal locations to specify the location of an Action Event during event creation.
- PRs: CHART R11 will contain changes for several PRs which will be identified for inclusion in R11 at a later time. This document does not address any such PRs.

1.2 Objectives

The main objective of this detailed design document is to provide software developers with a framework in which to implement the requirements identified in the CHART R11 Requirements

document. A matrix mapping requirements to the design is presented in Section 7 (Mapping to Requirements).

1.3 Scope

This design is limited to Release 11 of the CHART system. It addresses both the design of the server components of CHART and the Graphical User Interface (GUI) components of CHART to support the new features being added. This design does not include designs for components implemented in earlier releases of the CHART system.

1.4 Design Process

The design was created by capturing the requirements of the system in UML Use Case diagrams. Class diagrams were generated showing the high level objects that address the Use Cases. Sequence diagrams were generated to show how each piece of major functionality will be achieved. This process was iterative in nature – the creation of sequence diagrams sometimes caused re-engineering of the class diagrams, and vice versa.

1.5 Design Tools

The work products contained within this design will be extracted from the Enterprise Architect design tool. Within this tool, the design will be contained in the project named "chartdesign" in the folder named "CHART".

1.6 Work Products

The final CHART Release 11 design consists of the following work products:

- Human-Machine Interface section which provides descriptions of the screens that are changing or being added in order to allow the user to perform the described uses.
- Use Case diagrams that capture the requirements of the system
- UML Class diagrams, showing the software objects which allow the system to accommodate the uses of the system described in the Use Case diagrams
- UML Sequence diagrams showing how the classes interact to accomplish major functions of the system
- Requirement Verification Traceability Matrix that shows how this design meets the documented requirements for this feature

2 Architecture

The sections below discuss specific elements of the architecture and software components that are created, changed, or used in CHART Release 11.

2.1 Network/Hardware

CHART Release 11 features do not impact the network or hardware architecture of the CHART system.

2.2 Software

CHART uses the Common Object Request Broker Architecture (CORBA) as the base architecture, with custom built software objects made available on the network allowing their data to be accessed via well defined CORBA interfaces. Communications to remote devices use the Field Management Server (FMS) architecture. Newer external interfaces such as the User Management web service, Data Exporter, and GIS service employ a web services architecture combining an HTTP request/response structure to pass XML messages.

Except where noted in the subsections below, CHART Release 11 features do not impact the software architecture of the CHART System.

2.2.1 COTS Products

2.2.1.1 CHART

CHART uses numerous COTS products for both run-time and development. No additional COTS products are added as part of R11. The following table contains existing COTS products that have not changed for CHART Release 11:

Product Name	Description
Apache ActiveMQ	CHART uses this to connect to RITIS JMS queues
Apache Jakarta Ant	CHART uses Apache Jakarta Ant 1.6.5 to build CHART applications and deployment jars.
Apache Tomcat	CHART uses Apache Tomcat 6.0.29 as the GUI web server.
Apache XML-RPC	CHART uses the apache xmlrpc java library 3.1.2 protocol that uses XML over HTTP to implement remote procedure calls. The video Flash streaming "red button" ("kill switch") API uses XML over HTTP remote procedure calls.
Bison/Flex	CHART uses Bison and Flex as part of the process of compiling binary macro files used for performing camera menu operations on Vicon Surveyor VFT cameras.
bsn.autosuggest	The event resource search feature and the EORS integration feature use version 2.1.3 of the bsn.autosuggest JavaScript code from brandspankingnew.net. This tool is freely available and

Product Name	Description
	is included as source code in the CHART GUI. It provides a simple JavaScript tool that can be associated with a text entry field. When the user types characters in the field, the tool waits until there has been no typing for a configurable number of milliseconds (to make sure the user is done typing) then places an AJAX call to a web server which can return suggested results that match the user entered text. The bsn.autosuggest tool then parses the results (XML or JSON) and displays a UI element that shows the user the suggestions and lets them select one of them by clicking on it. If a suggested element is selected by the user, a configurable JS method is invoked to allow the application to use the selected suggestion. Use of this tool is being expanded in CHART Release 10 to help the user locate notification contacts for viewing and editing.
CoreTec Decoder Control	CHART uses a CoreTec supplied decoder control API for commanding CoreTec decoders.
Dialogic API	CHART uses the Dialogic API for sending and receiving Dual Tone Multi Frequency (DTMF) tones for HAR communications.
Flex3 SDK	The CHART GUI will use the Flex3 SDK, version 3.3 to provide the Flex compiler, the standard Flex libraries, and examples for building Flex applications.
GIF89 Encoder	Utility classes that can create .gif files with optional animation. This utility is used for the creation of DMS True Display windows.
JAXB	CHART uses the jaxb java library to automate the tedious task of hand-coding field-by-field XML translation and validation for exported data.
JDOM	CHART uses JDOM b7 (beta-7) dated 2001-07-07. JDOM provides a way to represent an XML document for easy and efficient reading, manipulation, and writing.
JacORB	CHART uses a compiled, patched version of JacORB 2.3.1. The JacORB source code, including the patched code, is kept in the CHART source repository.
JavaMail API	The CHART Notification Service uses the JavaMail API 1.4.4, an optional Java package which provides SMTP e-mail support.
Java Run-Time (JRE)	CHART uses 1.6.0_21
JavaService	CHART uses JavaService to install the server side Java software components as Windows services.
JAXEN	CHART uses JAXEN 1.0-beta-8 dated 2002-01-09. The

Product Name	Description
	Jaxen project is a Java XPath Engine. Jaxen is a universal object model walker, capable of evaluating XPath expressions across multiple models.
JoeSNMP	CHART uses JoeSNMP version 0.2.6 dated 2001-11-11. JoeSNMP is a Java based implementation of the SNMP protocol. CHART uses for commanding iMPath MPEG-2 decoders and for communications with NTCIP DMSs.
JSON-simple	CHART uses the JSON-simple java library to encode/decode strings that use JSON (JavaScript Object Notation).
JTS	CHART uses the Java Topology Suite (JTS) version 1.8.0 for geographical utility classes.
Log4J	CHART uses the log4J version 1.2.15 for logging purposes.
NSIS	CHART uses the Nullsoft Scriptable Installation System (NSIS), version 2.45, as the server side installation package.
Nuance Text To Speech	For text-to-speech (TTS) conversion CHART uses a TTS engine that integrates with Microsoft Speech Application Programming Interface (MSSAPI), version 5.1. CHART uses Nuance Vocalizer 4.0 with Nuance SAPI 5.1 Integration for Nuance Vocalizer 4.0.
OpenLayers	The Integrated Map feature uses the Open Layers JavaScript API 2.10 (http://openlayers.org/) in order to render interactive maps within a web application without relying on vendor specific software. Open Layers is an open source product released under a BSD style license which can be found at (http://svn.openlayers.org/trunk/openlayers/license.txt).
O'Reilly Servlet	Provides classes that allow the CHART GUI to handle file uploads via multi-part form submission.
Prototype Javascript Library	The CHART GUI uses the Prototype JavaScript library, version 1.7, a cross-browser compatible JavaScript library provides many features (including easy Ajax support).
SAXPath	CHART uses SAXPath 1.0-beta-6 dated 2001-09-27. SAXPath is an event-based API for XPath parsers, that is, for parsers which parse XPath expressions.
MSSQL Server	CHART uses MS SQLServer (2008 R2) as its database and uses the MS SQL Server JDBC libraries (sqljdbc4.jar) for all database transactions.
SQLServer JDBC Driver	CHART uses this driver to lookup GIS related data and

Product Name	Description
	also to store Location Aliases in SQL Server databases.
Velocity Template Engine	Provides classes that CHART GUI uses in order to create dynamic web pages using velocity templates, CHART uses Velocity version 1.6.1 and tools version 1.4.
Vicon V1500 API	CHART uses a Vicon supplied API for commanding the ViconV1500 CPU to switch video on the Vicon V1500 switch

2.2.2 Deployment /Interface Compatibility

2.2.2.1 CHART

2.2.2.1.1 External Interfaces

This section describes the external interfaces being added in Release 11 of CHART.

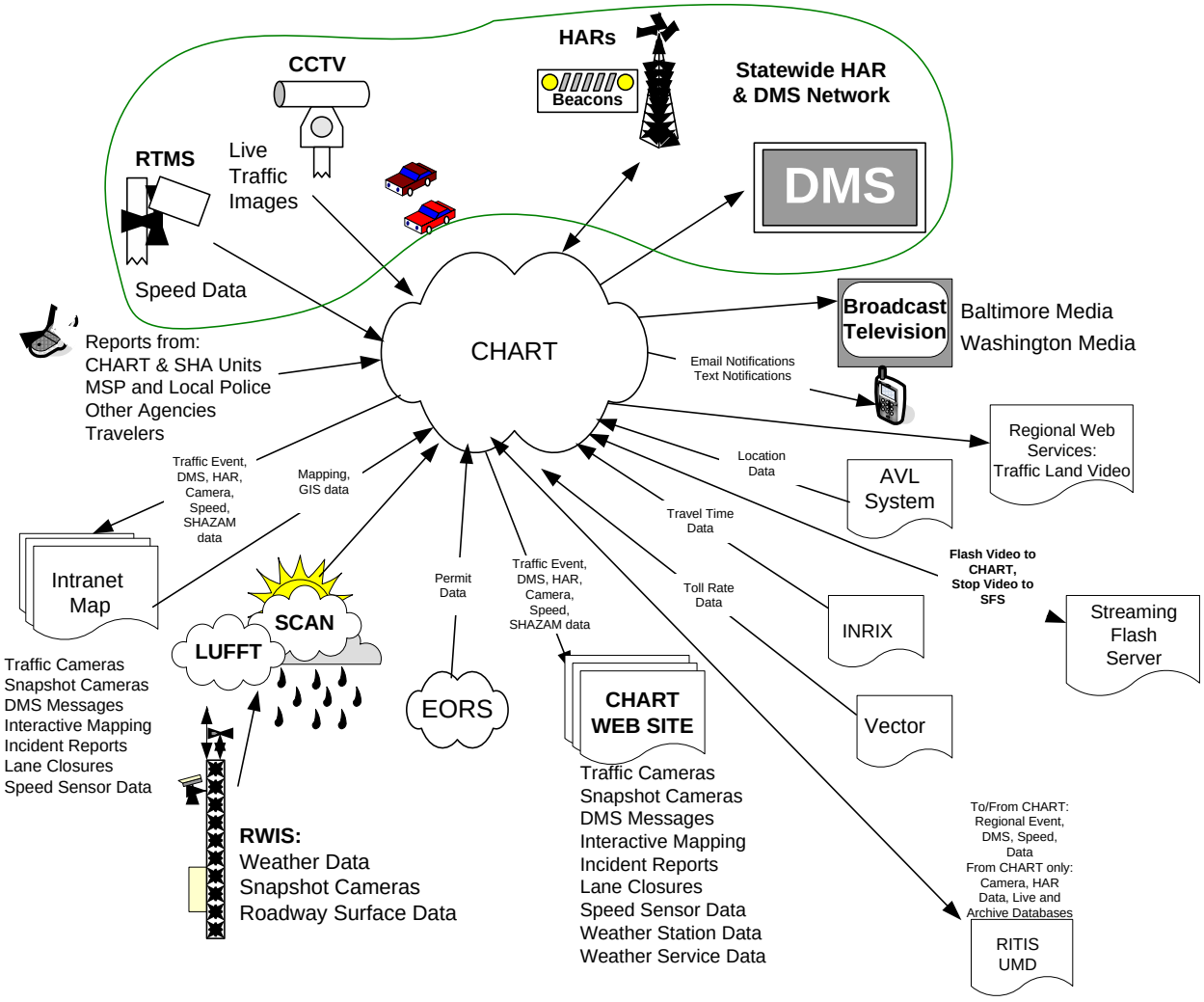
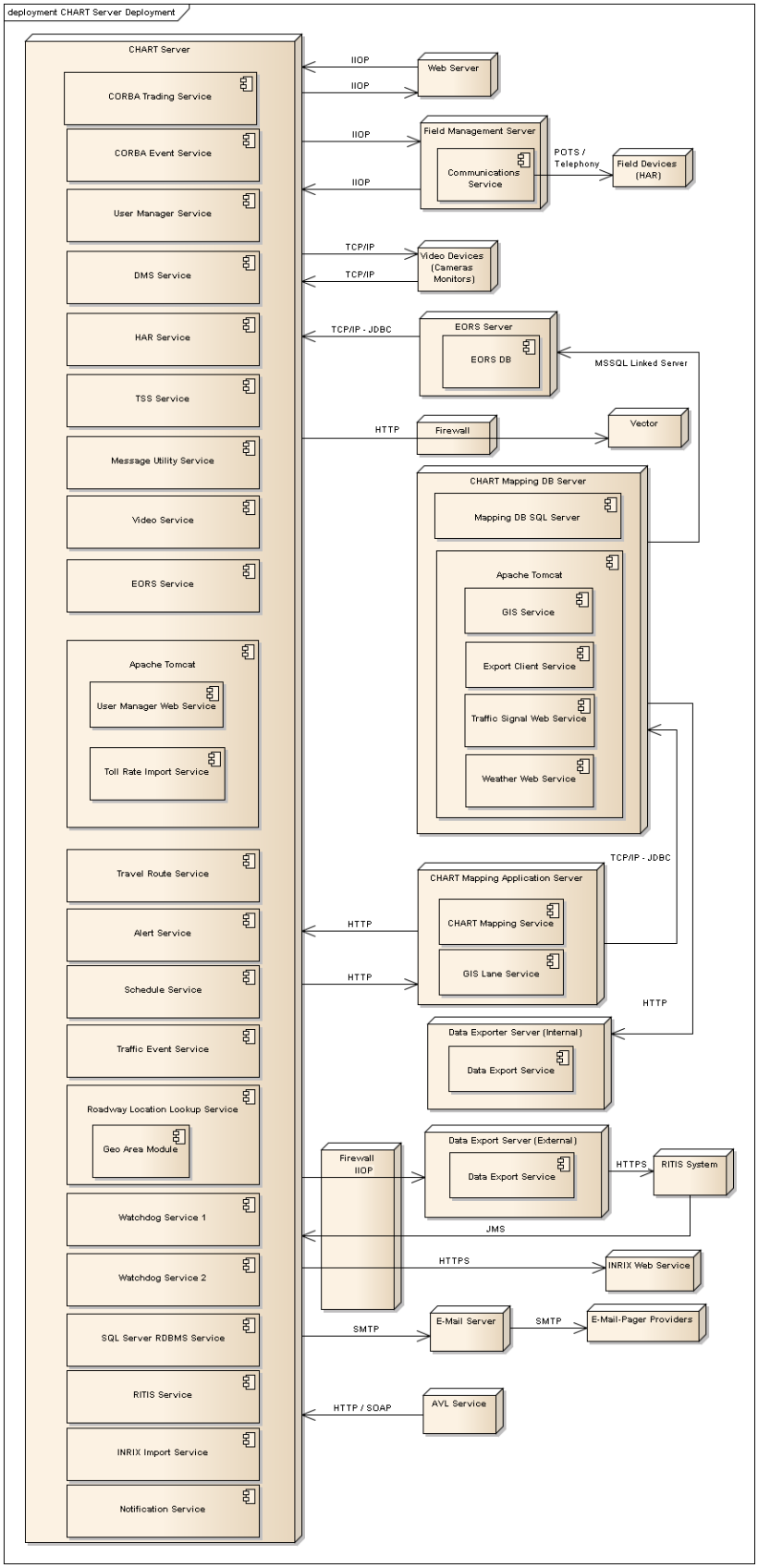


Figure 2-1 CHART and External Interfaces

The external interfaces modified/added for R11 are:

1. An interface to the AVL system is added. CHART pulls vehicle location data from the AVL system and it is used to show event resources on the CHART GUI home page map and to perform automated detection of arrived/responded and departed status of traffic event participants. The location data is also used to automatically detect when a specific resource has arrived on the scene of a traffic event when a participant of that type was requested.
2. The exporter service is changed to export additional information for each traffic event participant and to export traffic signals associated with action events. If a user adds notes for a traffic event participant (call sign, driver first name, driver last name, or notes), those notes will be included in the information exported for that participant.
3. An interface to access Traffic Signal data is added. A new CHART webservice will provide Traffic Signal information including ID, name and detailed location information. This webservice caches signal information for the GUI. This web service pulls data from the CHARTWeb database.

Server and GUI deployment diagrams are shown in the next two figures. The server deployment diagram is changed in R11 to show the CHART system interface to the AVL system.


deployment CHART Server Deployment
CHART Server
CORBA Trading Service
CORBA Event Service
User Manager Service
DMS Service
HAR Service
TSS Service
Message Utility Service
Video Service
EORS Service
Apache Tomcat
User Manager Web Service
Toll Rate Import Service
Travel Route Service
Alert Service
Schedule Service
Traffic Event Service
Roadway Location Lookup Service
Geo Area Module
Watchdog Service 1
Watchdog Service 2
SQL Server RDBMS Service
RITIS Service
INRIX Import Service
Notification Service
IIOP
IIOP
Web Server
IIOP
IIOP
Field Management Server
Communications Service
POTS / Telephony
Field Devices (HAR)
TCP/IP
TCP/IP
Video Devices (Cameras Monitors)
TCP/IP - JDBC
EORS Server
EORS DB
MSSQL Linked Server
HTTP
Firewall
Vector
CHART Mapping DB Server
Mapping DB SQL Server
Apache Tomcat
GIS Service
Export Client Service
Traffic Signal Web Service
Weather Web Service
TCP/IP - JDBC
CHART Mapping Application Server
CHART Mapping Service
GIS Lane Service
HTTP
HTTP
HTTP
Data Exporter Server (Internal)
Data Export Service
Firewall IIOP
Data Export Server (External)
Data Export Service
HTTPS
RITIS System
JMS
HTTPS
INRIX Web Service
SMTP
E-Mail Server
SMTP
E-Mail-Pager Providers
HTTP / SOAP
AVL Service

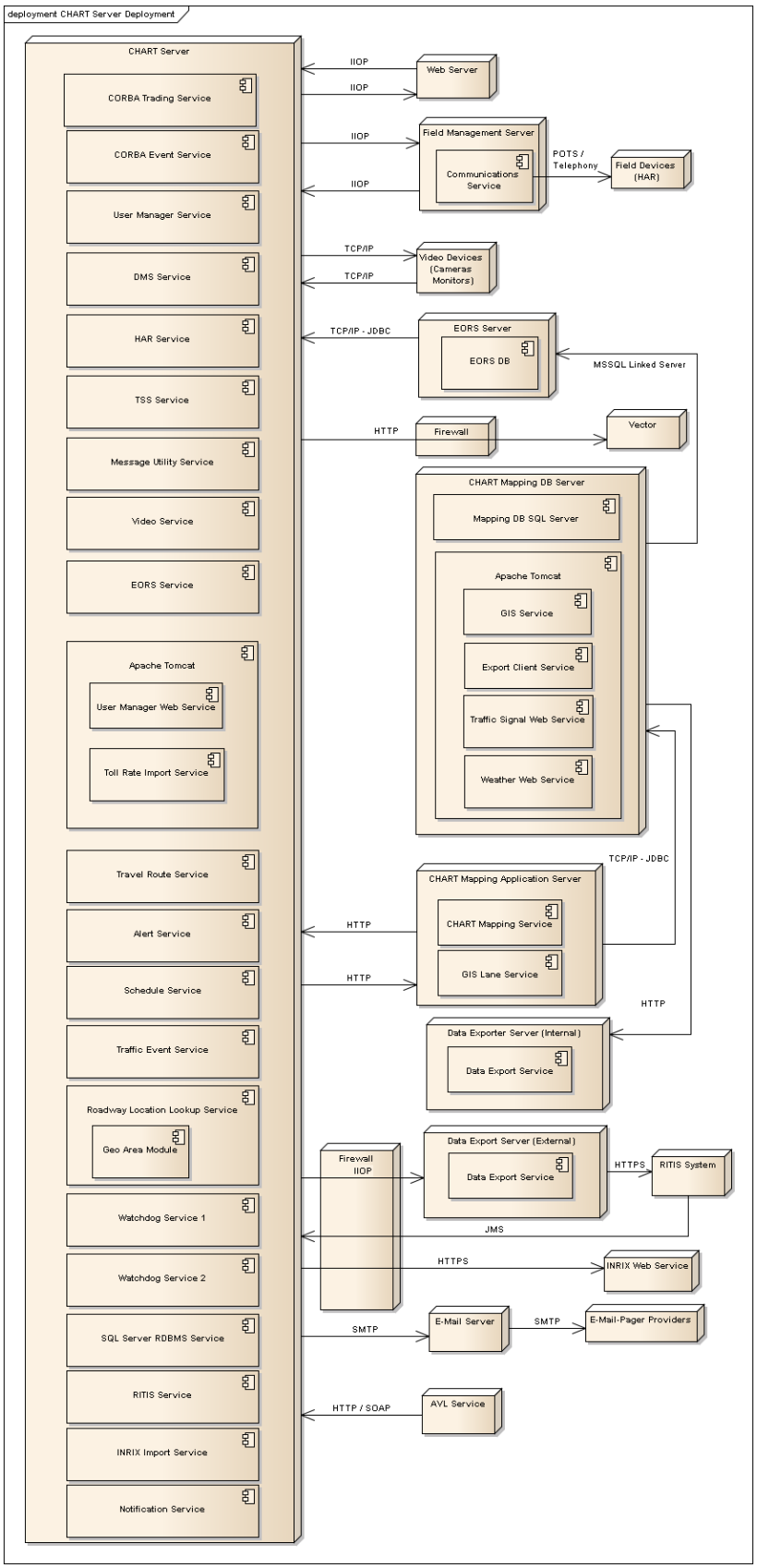

deployment CHART Server Deployment
CHART Server
CORBA Trading Service
CORBA Event Service
User Manager Service
DMS Service
HAR Service
TSS Service
Message Utility Service
Video Service
EORS Service
Apache Tomcat
User Manager Web Service
Toll Rate Import Service
Travel Route Service
Alert Service
Schedule Service
Traffic Event Service
Roadway Location Lookup Service
Geo Area Module
Watchdog Service 1
Watchdog Service 2
SQL Server RDBMS Service
RITIS Service
INRIX Import Service
Notification Service
IIOP
IIOP
Web Server
IIOP
Field Management Server
Communications Service
IIOP
POTS / Telephony
Field Devices (HAR)
TCP/IP
TCP/IP
Video Devices (Cameras Monitors)
TCP/IP - JDBC
EORS Server
EORS DB
MSSQL Linked Server
HTTP
Firewall
Vector
CHART Mapping DB Server
Mapping DB SQL Server
Apache Tomcat
GIS Service
Export Client Service
Traffic Signal Web Service
Weather Web Service
TCP/IP - JDBC
CHART Mapping Application Server
CHART Mapping Service
GIS Lane Service
HTTP
HTTP
HTTP
Data Exporter Server (Internal)
Data Export Service
Firewall
IIOP
Data Export Server (External)
Data Export Service
HTTPS
RITIS System
JMS
HTTPS
INRIX Web Service
SMTP
E-Mail Server
SMTP
E-Mail-Pager Providers
HTTP / SOAP
AVL Service

Figure 2-2 R11 Server Deployment

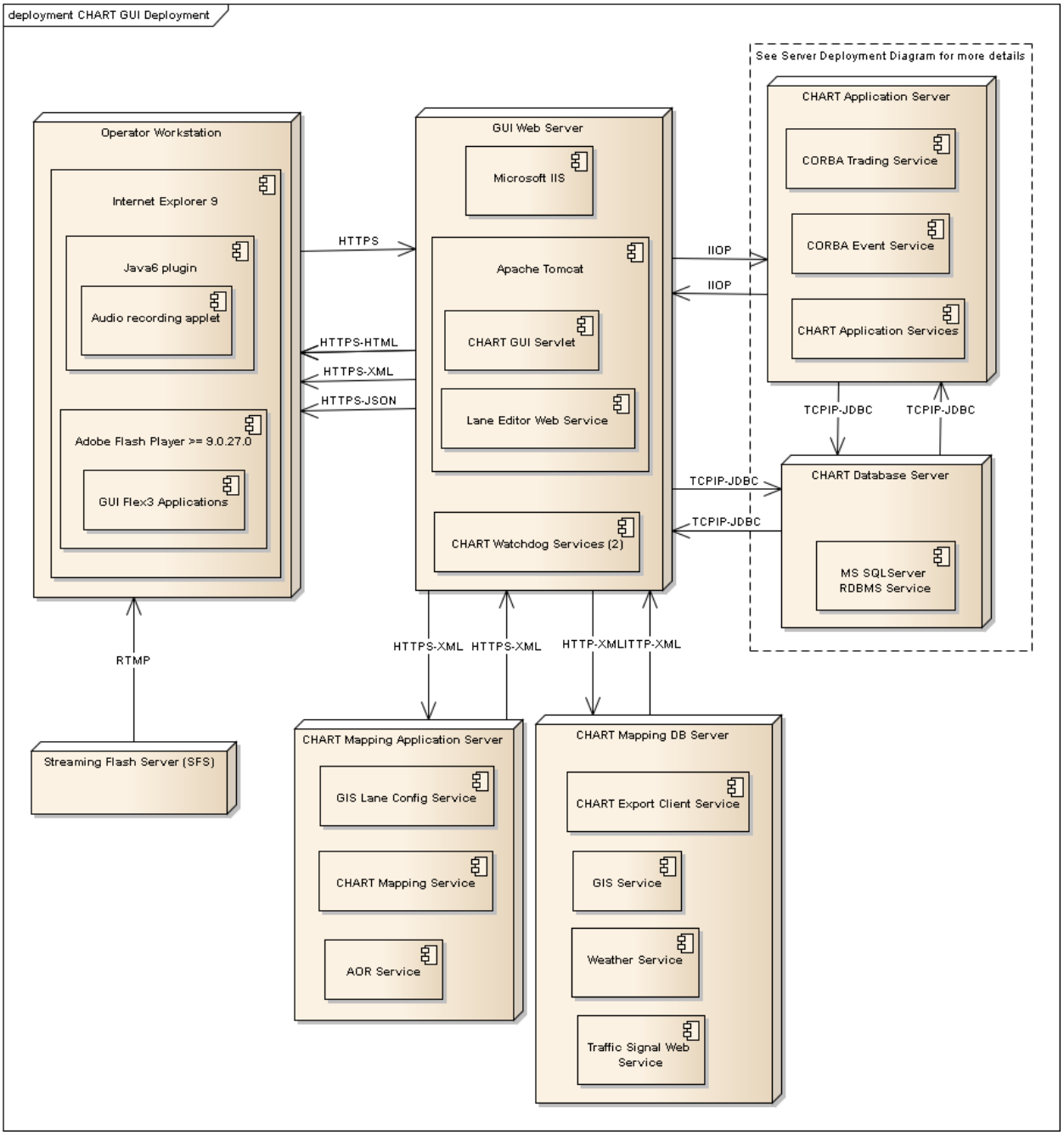


Figure 2-3 R11 GUI Deployment

2.2.2.1.2 Internal Interfaces

This section describes the internal interfaces being added or modified in Release 11 of the CHART system.

1. The R11 Participants/AVL feature adds a CORBA based interface to the existing traffic event service to allow the GUI to manage event resources and types. Existing CORBA

interfaces in the traffic event service are modified to support the new features related to traffic event participants.

2. The R11 Decision Support feature adds a CORBA based interface to the existing message utility service to allow the GUI to manage HAR decision support message templates. Existing CORBA interfaces in the DMS and HAR services are modified to support the new decision support eligible flag. Existing CORBA interfaces in the traffic even service are modified to support suggesting HAR messages and suggesting items to remove from the response plan.
3. The R11 Traffic Signal I/F feature adds an http interface from the GUI to the new Traffic Signal Web Service.

2.3 Security

This section describes the security being added or modified in Release 11 of the CHART system. Unless otherwise noted, features being added for CHART Release 11 do not change security aspects of the CHART system.

2.4 Data

CHART Release 11 will be tested with the fielded MS SQL Server version.

2.4.1 Data Storage

The CHART System stores most of its data in a non-spatial MS SQL Server database. Additionally the Integrated Map feature adds the ability to store location aliases to the spatial SQL Server database. Some data is stored in flat files on the CHART servers.

This section describes all of these types of data.

2.4.1.1 Database

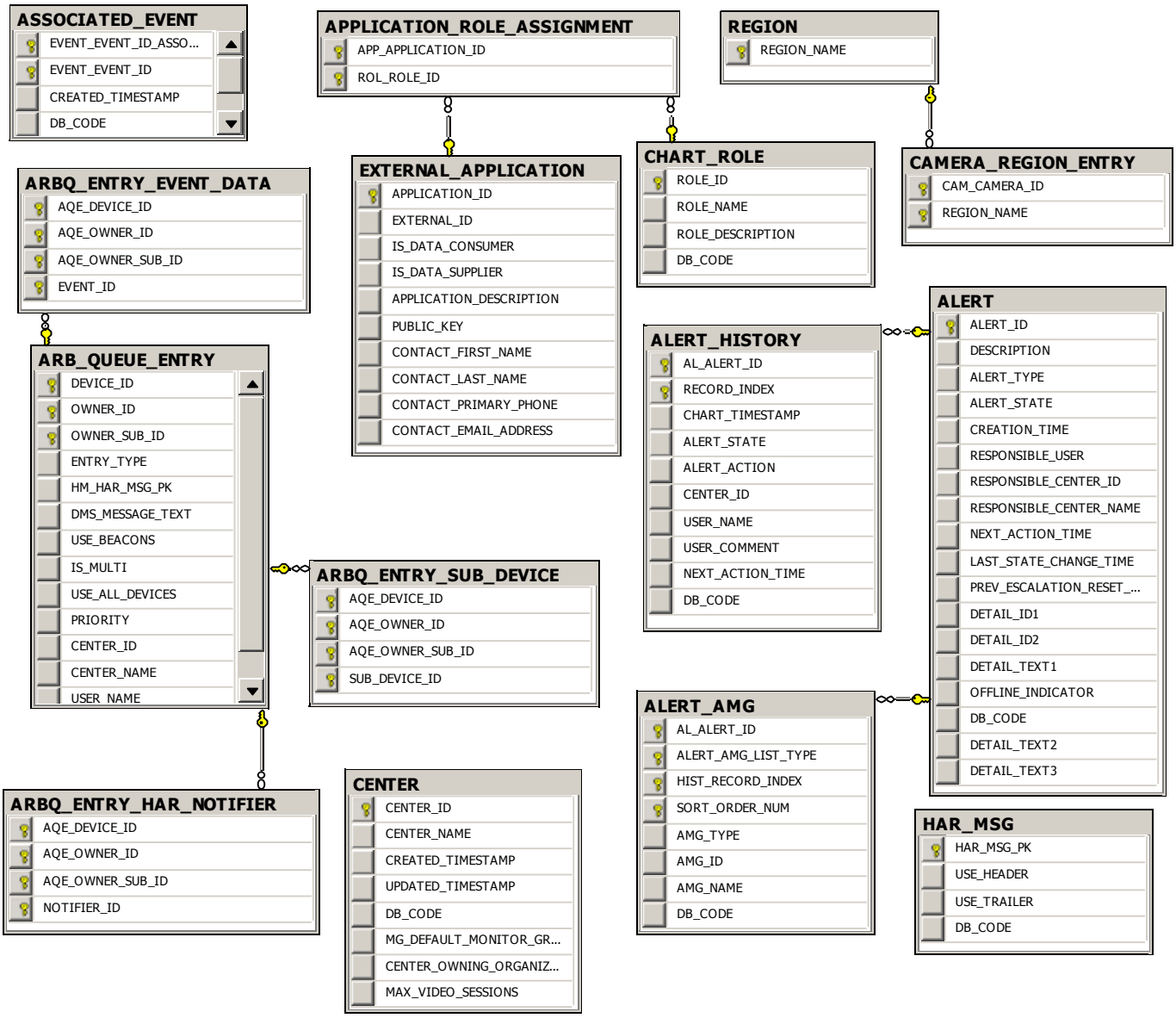
2.4.1.1.1 Database Architecture

Except as noted CHART Release 11 features do not impact the overall architecture of the CHART database.

2.4.1.1.2 Logical Design

2.4.1.1.2.1 CHART Entity Relationship Diagram (ERD)

CHART Database entity relationship diagrams are shown below in the multiple pages of figures labeled collectively as one Figure. These diagrams represent the database design prior to R11 and the Table Definition Report sections that follow describe the changes that will be made for R11.


ASSOCIATED_EVENT
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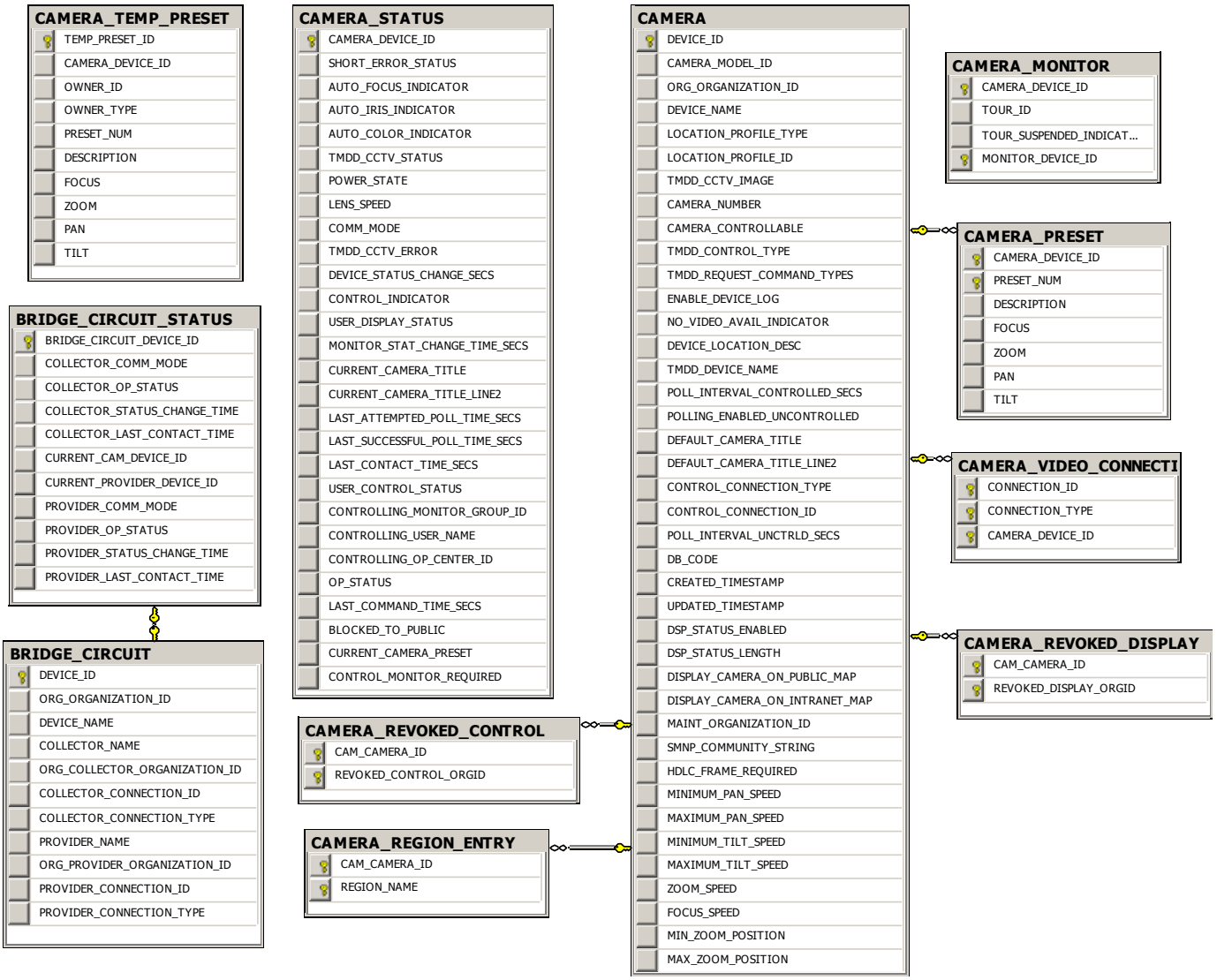
EVENT_EVENT_ID
CREATED_TIMESTAMP
DB_CODE
APPLICATION_ROLE_ASSIGNMENT
APP_APPLICATION_ID
ROL_ROLE_ID
REGION
REGION_NAME
ARBQ_ENTRY_EVENT_DATA
AQE_DEVICE_ID
AQE_OWNER_ID
AQE_OWNER_SUB_ID
EVENT_ID
EXTERNAL_APPLICATION
APPLICATION_ID
EXTERNAL_ID
IS_DATA_CONSUMER
IS_DATA_SUPPLIER
APPLICATION_DESCRIPTION
PUBLIC_KEY
CONTACT_FIRST_NAME
CONTACT_LAST_NAME
CONTACT_PRIMARY_PHONE
CONTACT_EMAIL_ADDRESS
CHART_ROLE
ROLE_ID
ROLE_NAME
ROLE_DESCRIPTION
DB_CODE
CAMERA_REGION_ENTRY
CAM_CAMERA_ID
REGION_NAME
ALERT
ALERT_ID
DESCRIPTION
ALERT_TYPE
ALERT_STATE
CREATION_TIME
RESPONSIBLE_USER
RESPONSIBLE_CENTER_ID
RESPONSIBLE_CENTER_NAME
NEXT_ACTION_TIME
LAST_STATE_CHANGE_TIME
PREV_ESCALATION_RESET_...
DETAIL_ID1
DETAIL_ID2
DETAIL_TEXT1
OFFLINE_INDICATOR
DB_CODE
DETAIL_TEXT2
DETAIL_TEXT3
ALERT_HISTORY
AL_ALERT_ID
RECORD_INDEX
CHART_TIMESTAMP
ALERT_STATE
ALERT_ACTION
CENTER_ID
USER_NAME
USER_COMMENT
NEXT_ACTION_TIME
DB_CODE
ARB_QUEUE_ENTRY
DEVICE_ID
OWNER_ID
OWNER_SUB_ID
ENTRY_TYPE
HM_HAR_MSG_PK
DMS_MESSAGE_TEXT
USE_BEACONS
IS_MULTI
USE_ALL_DEVICES
PRIORITY
CENTER_ID
CENTER_NAME
USER_NAME
ARBQ_ENTRY_SUB_DEVICE
AQE_DEVICE_ID
AQE_OWNER_ID
AQE_OWNER_SUB_ID
SUB_DEVICE_ID
ALERT_AMG
AL_ALERT_ID
ALERT_AMG_LIST_TYPE
HIST_RECORD_INDEX
SORT_ORDER_NUM
AMG_TYPE
AMG_ID
AMG_NAME
DB_CODE
HAR_MSG
HAR_MSG_PK
USE_HEADER
USE_TRAILER
DB_CODE
ARBQ_ENTRY_HAR_NOTIFIER
AQE_DEVICE_ID
AQE_OWNER_ID
AQE_OWNER_SUB_ID
NOTIFIER_ID
CENTER
CENTER_ID
CENTER_NAME
CREATED_TIMESTAMP
UPDATED_TIMESTAMP
DB_CODE
MG_DEFAULT_MONITOR_GR...
CENTER_OWNING_ORGANIZ...
MAX_VIDEO_SESSIONS


CAMERA_TEMP_PRESET
TEMP_PRESET_ID
CAMERA_DEVICE_ID
OWNER_ID
OWNER_TYPE
PRESET_NUM
DESCRIPTION
FOCUS
ZOOM
PAN
TILT
CAMERA_STATUS
CAMERA_DEVICE_ID
SHORT_ERROR_STATUS
AUTO_FOCUS_INDICATOR
AUTO_IRIS_INDICATOR
AUTO_COLOR_INDICATOR
TMDD_CCTV_STATUS
POWER_STATE
LENS_SPEED
COMM_MODE
TMDD_CCTV_ERROR
DEVICE_STATUS_CHANGE_SECS
CONTROL_INDICATOR
USER_DISPLAY_STATUS
MONITOR_STAT_CHANGE_TIME_SECS
CURRENT_CAMERA_TITLE
CURRENT_CAMERA_TITLE_LINE2
LAST_ATTEMPTED_POLL_TIME_SECS
LAST_SUCCESSFUL_POLL_TIME_SECS
LAST_CONTACT_TIME_SECS
USER_CONTROL_STATUS
CONTROLLING_MONITOR_GROUP_ID
CONTROLLING_USER_NAME
CONTROLLING_OP_CENTER_ID
OP_STATUS
LAST_COMMAND_TIME_SECS
BLOCKED_TO_PUBLIC
CURRENT_CAMERA_PRESET
CONTROL_MONITOR_REQUIRED
CAMERA
DEVICE_ID
CAMERA_MODEL_ID
ORG_ORGANIZATION_ID
DEVICE_NAME
LOCATION_PROFILE_TYPE
LOCATION_PROFILE_ID
TMDD_CCTV_IMAGE
CAMERA_NUMBER
CAMERA_CONTROLLABLE
TMDD_CONTROL_TYPE
TMDD_REQUEST_COMMAND_TYPES
ENABLE_DEVICE_LOG
NO_VIDEO_AVAIL_INDICATOR
DEVICE_LOCATION_DESC
TMDD_DEVICE_NAME
POLL_INTERVAL_CONTROLLED_SECS
POLLING_ENABLED_UNCONTROLLED
DEFAULT_CAMERA_TITLE
DEFAULT_CAMERA_TITLE_LINE2
CONTROL_CONNECTION_TYPE
CONTROL_CONNECTION_ID
POLL_INTERVAL_UNCTRLD_SECS
DB_CODE
CREATED_TIMESTAMP
UPDATED_TIMESTAMP
DSP_STATUS_ENABLED
DSP_STATUS_LENGTH
DISPLAY_CAMERA_ON_PUBLIC_MAP
DISPLAY_CAMERA_ON_INTRANET_MAP
MAINT_ORGANIZATION_ID
SMNP_COMMUNITY_STRING
HDLC_FRAME_REQUIRED
MINIMUM_PAN_SPEED
MAXIMUM_PAN_SPEED
MINIMUM_TILT_SPEED
MAXIMUM_TILT_SPEED
ZOOM_SPEED
FOCUS_SPEED
MIN_ZOOM_POSITION
MAX_ZOOM_POSITION
CAMERA_MONITOR
CAMERA_DEVICE_ID
TOUR_ID
TOUR_SUSPENDED_INDICAT...
MONITOR_DEVICE_ID
CAMERA_PRESET
CAMERA_DEVICE_ID
PRESET_NUM
DESCRIPTION
FOCUS
ZOOM
PAN
TILT
CAMERA_VIDEO_CONNECTI
CONNECTION_ID
CONNECTION_TYPE
CAMERA_DEVICE_ID
CAMERA_REVOKED_DISPLAY
CAM_CAMERA_ID
REVOKED_DISPLAY_ORGID
BRIDGE_CIRCUIT_STATUS
BRIDGE_CIRCUIT_DEVICE_ID
COLLECTOR_COMM_MODE
COLLECTOR_OP_STATUS
COLLECTOR_STATUS_CHANGE_TIME
COLLECTOR_LAST_CONTACT_TIME
CURRENT_CAM_DEVICE_ID
CURRENT_PROVIDER_DEVICE_ID
PROVIDER_COMM_MODE
PROVIDER_OP_STATUS
PROVIDER_STATUS_CHANGE_TIME
PROVIDER_LAST_CONTACT_TIME
BRIDGE_CIRCUIT
DEVICE_ID
ORG_ORGANIZATION_ID
DEVICE_NAME
COLLECTOR_NAME
ORG_COLLECTOR_ORGANIZATION_ID
COLLECTOR_CONNECTION_ID
COLLECTOR_CONNECTION_TYPE
PROVIDER_NAME
ORG_PROVIDER_ORGANIZATION_ID
PROVIDER_CONNECTION_ID
PROVIDER_CONNECTION_TYPE
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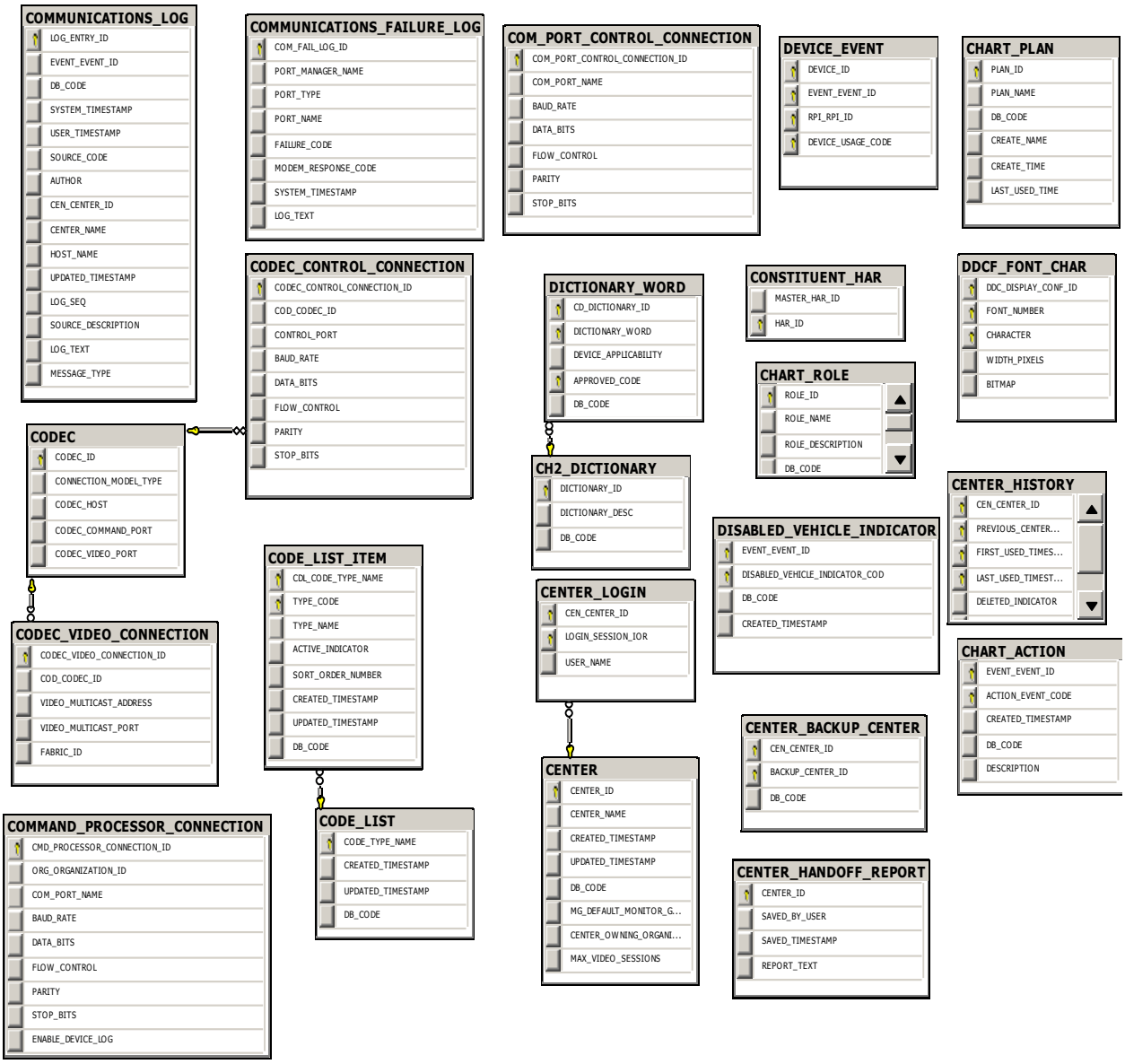
REVOKED_CONTROL_ORGID
CAMERA_REGION_ENTRY
CAM_CAMERA_ID
REGION_NAME


COMMUNICATIONS_LOG
LOG_ENTRY_ID
EVENT_EVENT_ID
DB_CODE
SYSTEM_TIMESTAMP
USER_TIMESTAMP
SOURCE_CODE
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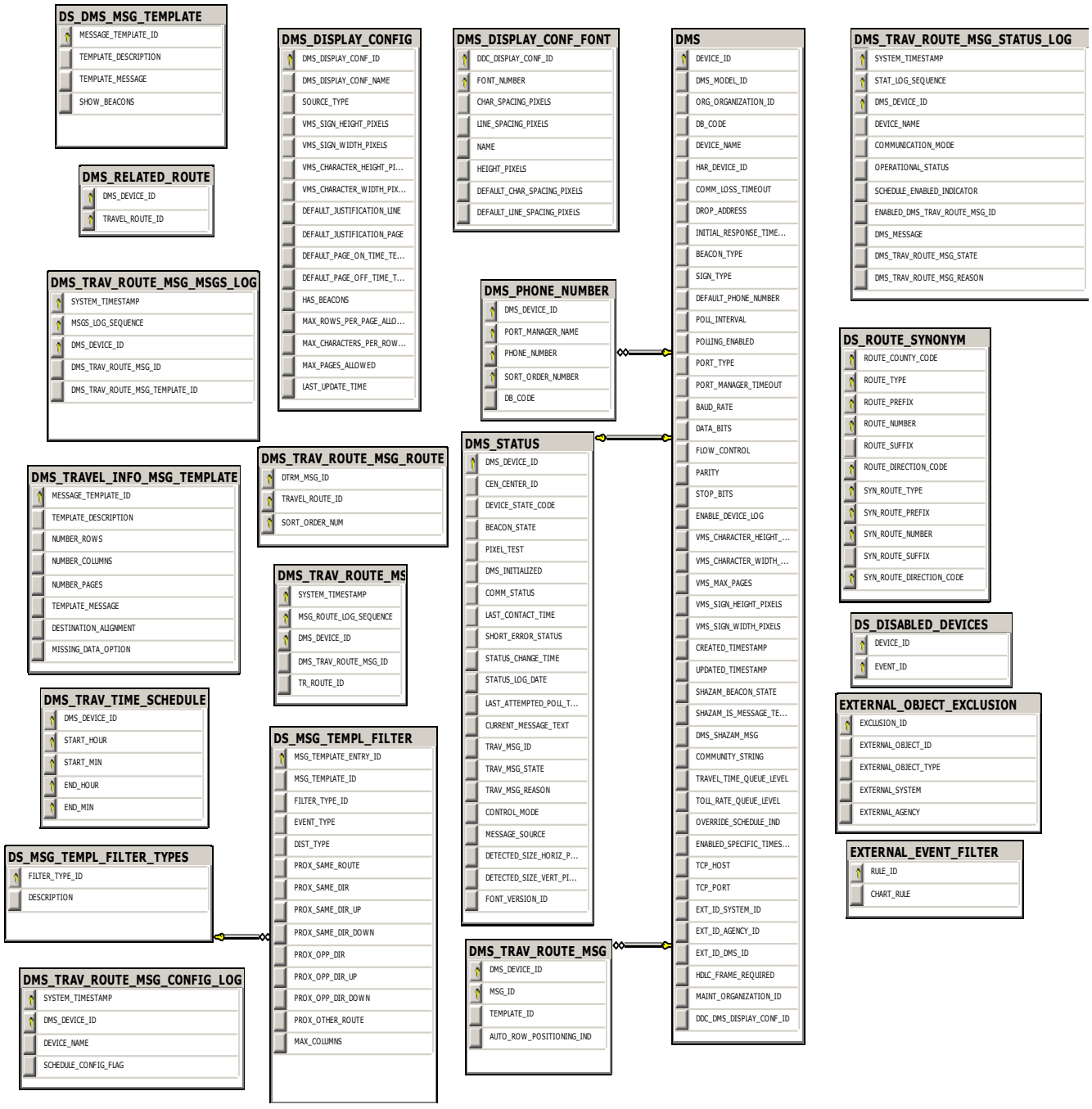
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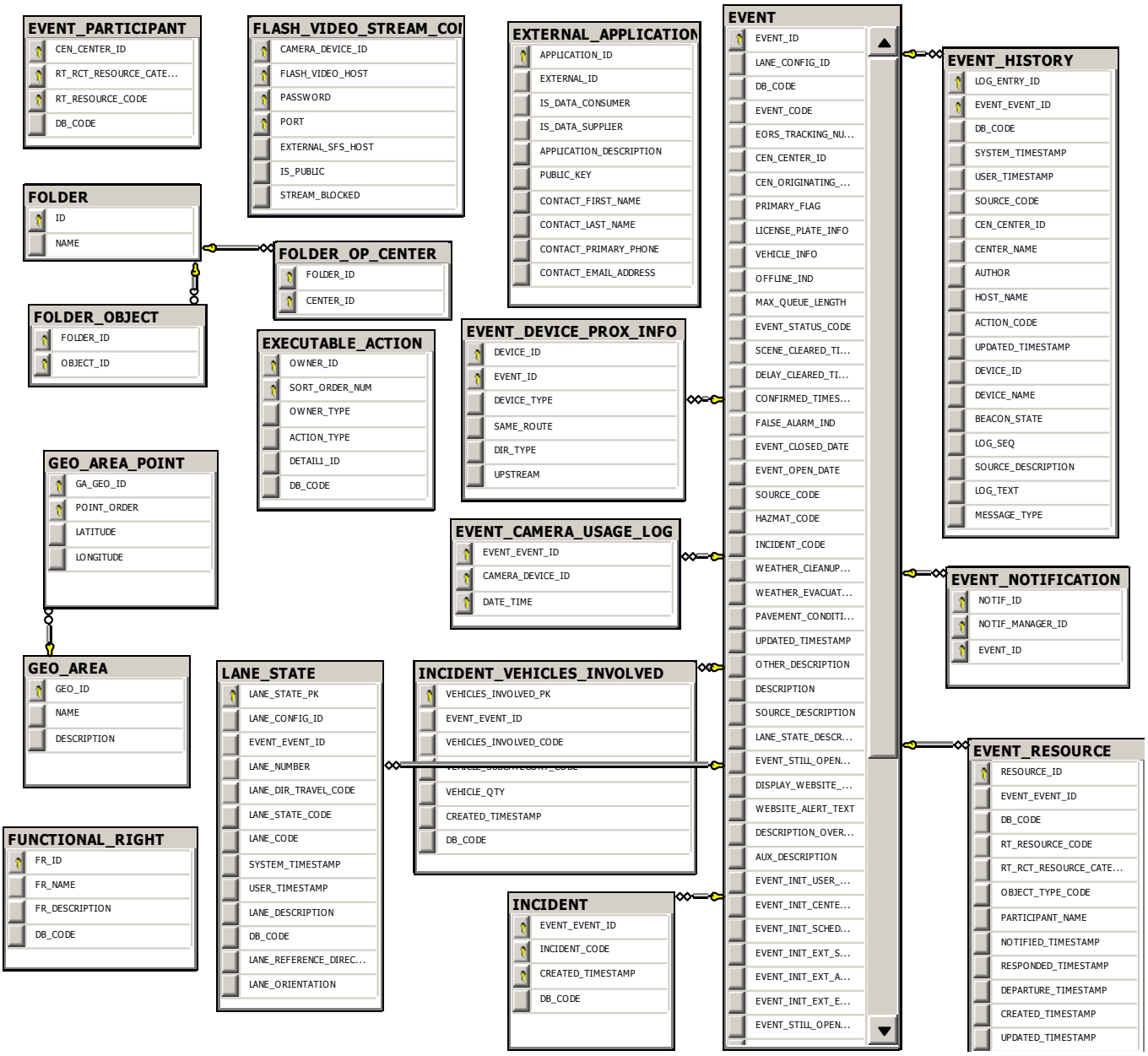
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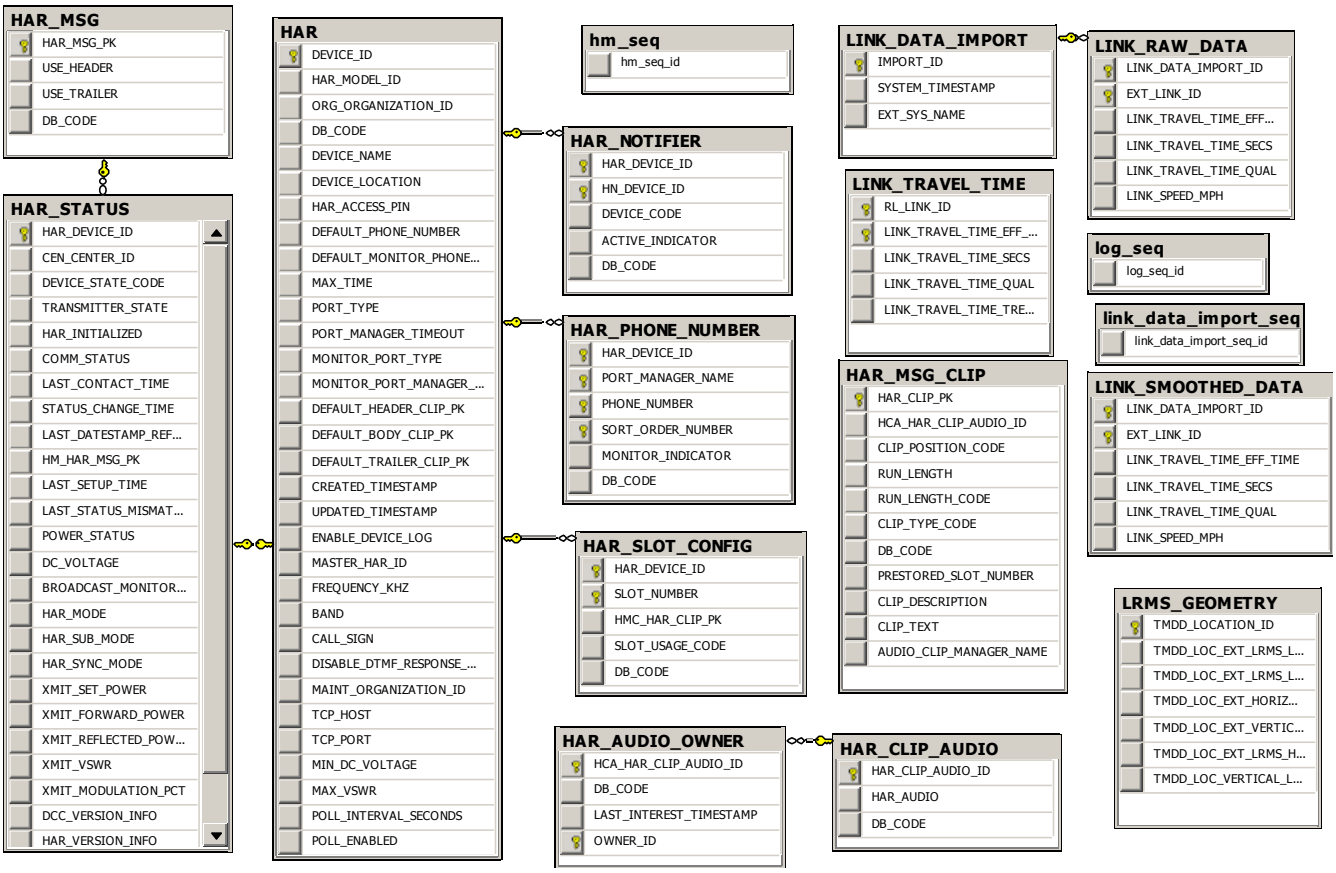
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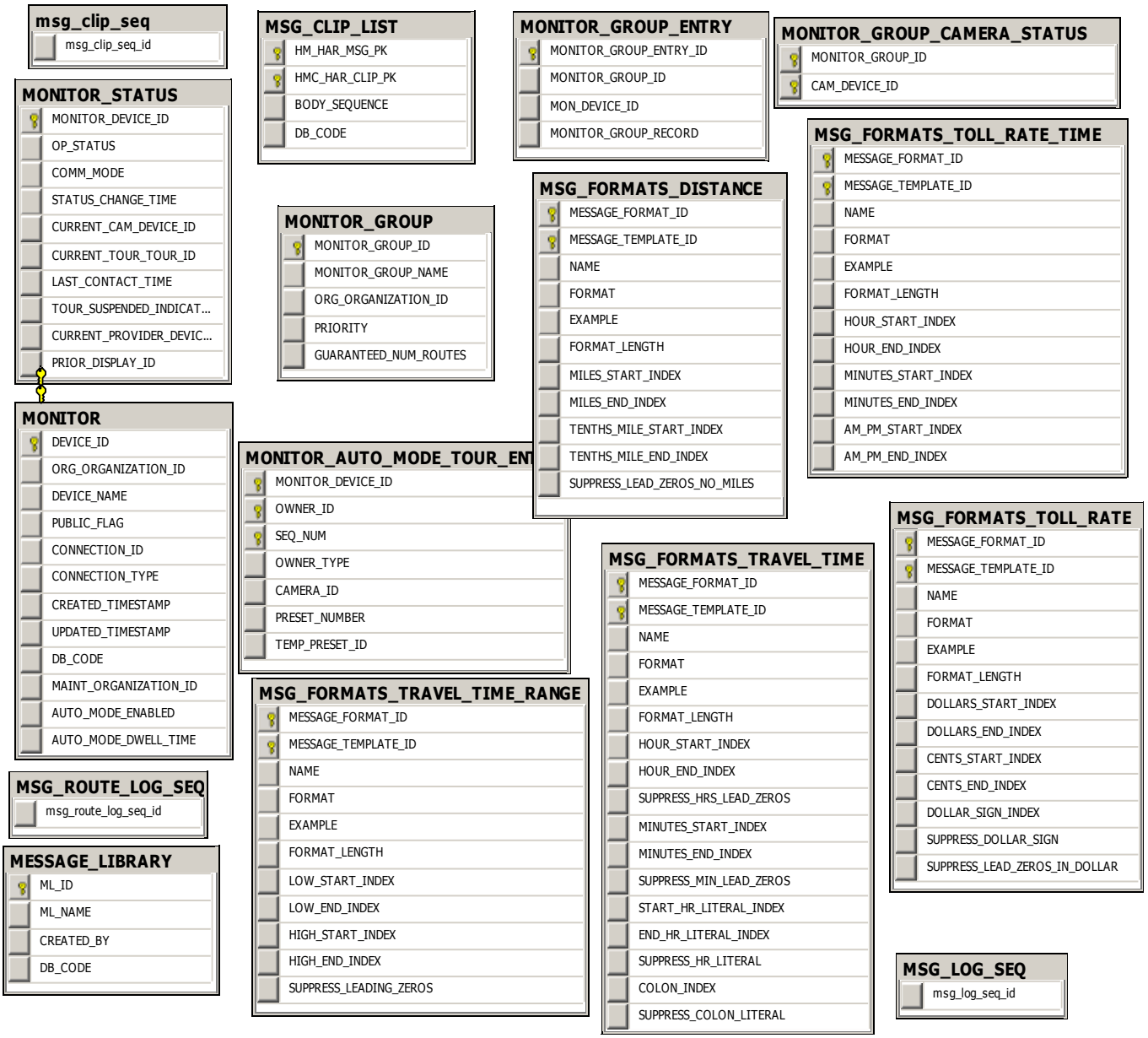
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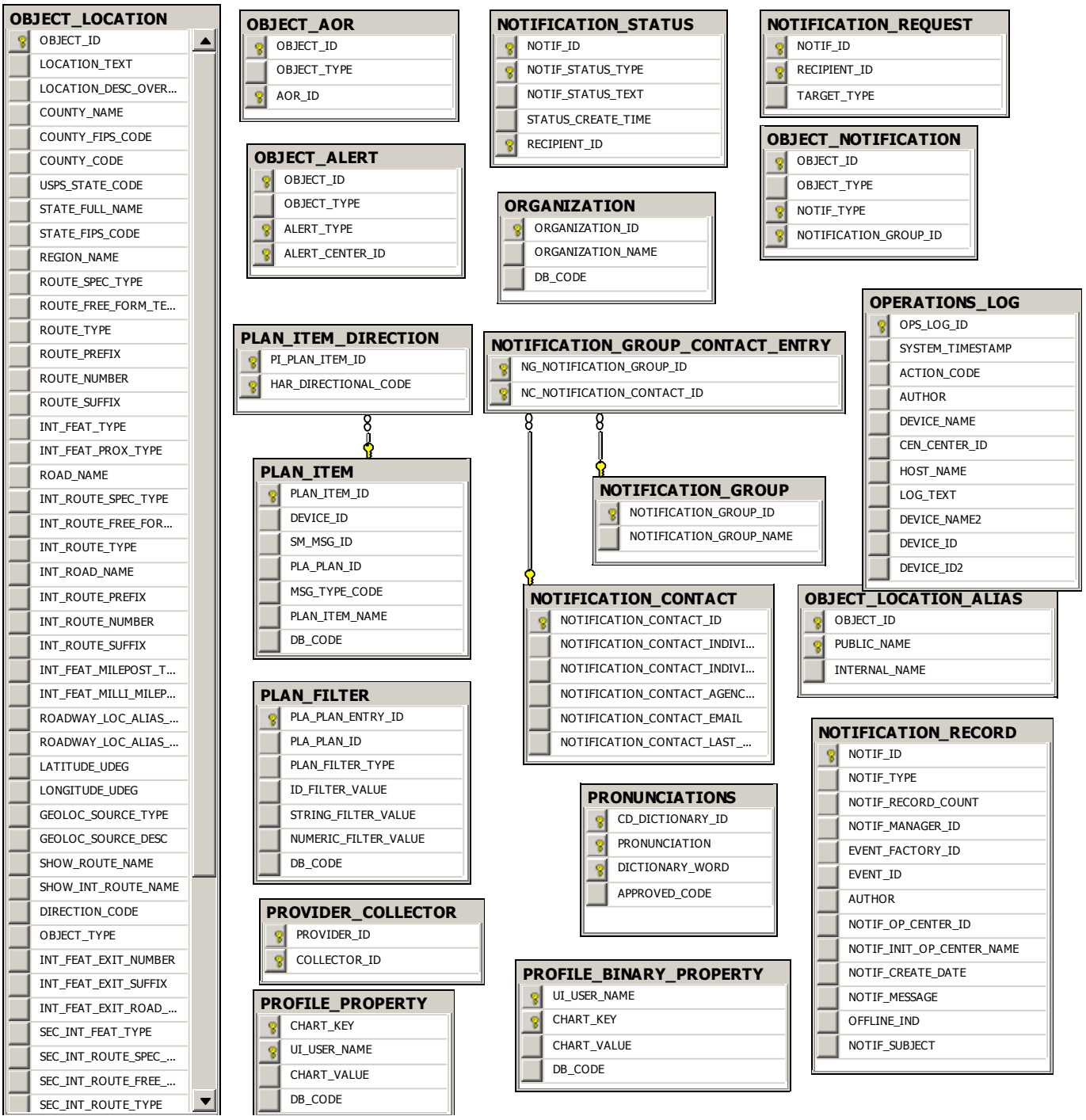
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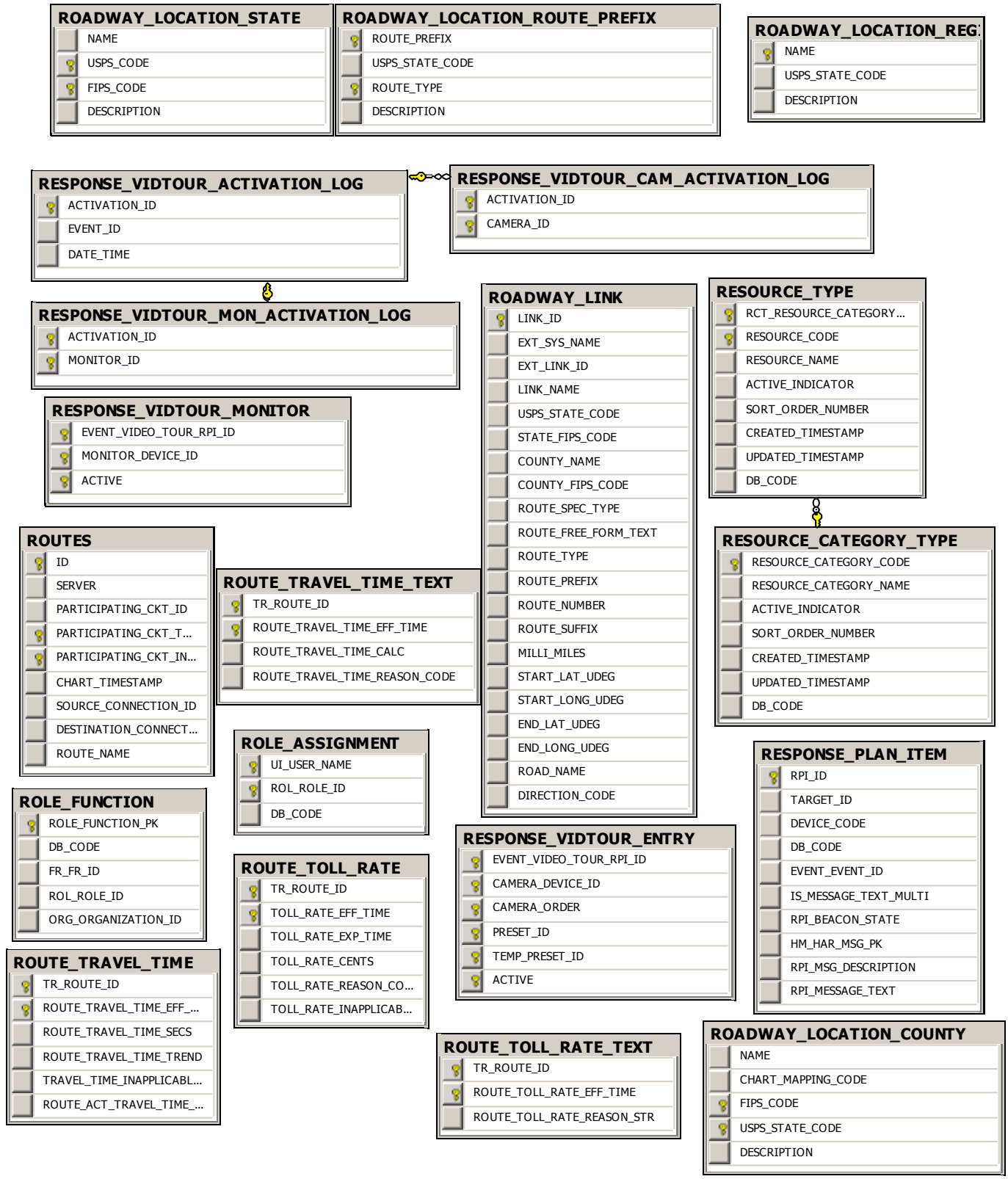
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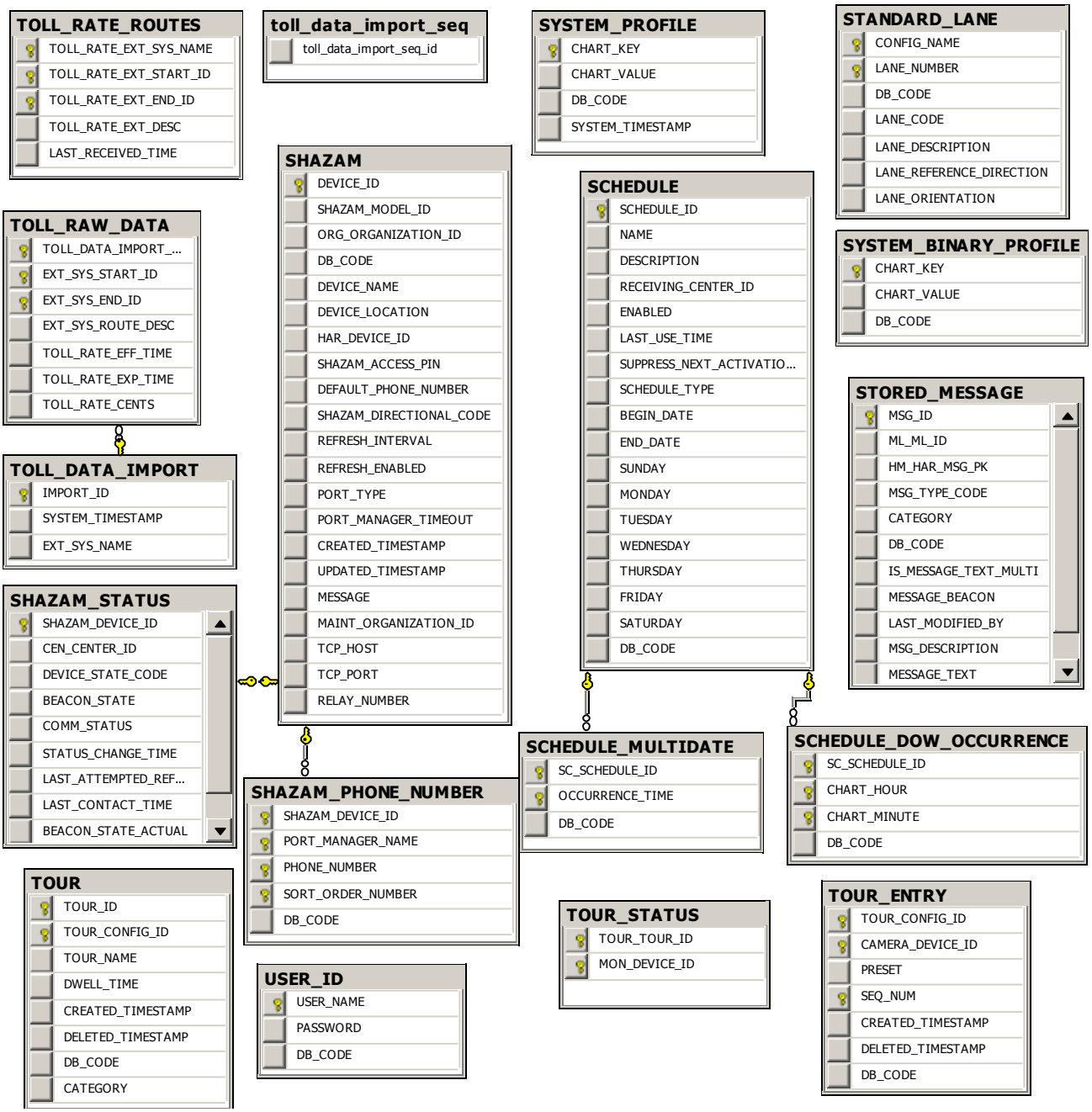
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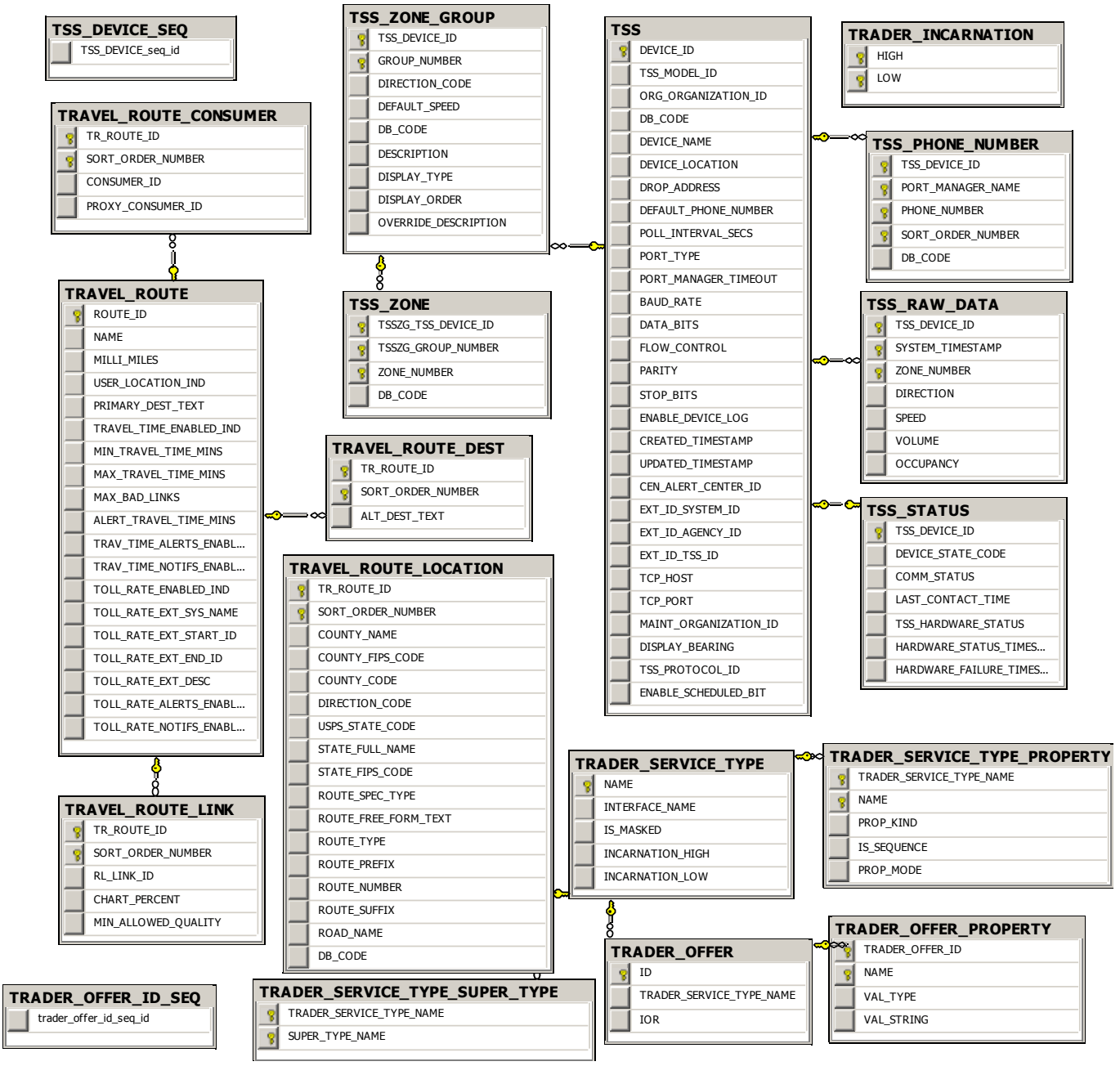
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STOP_BITS
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STATE_FIPS_CODE
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IS_SEQUENCE
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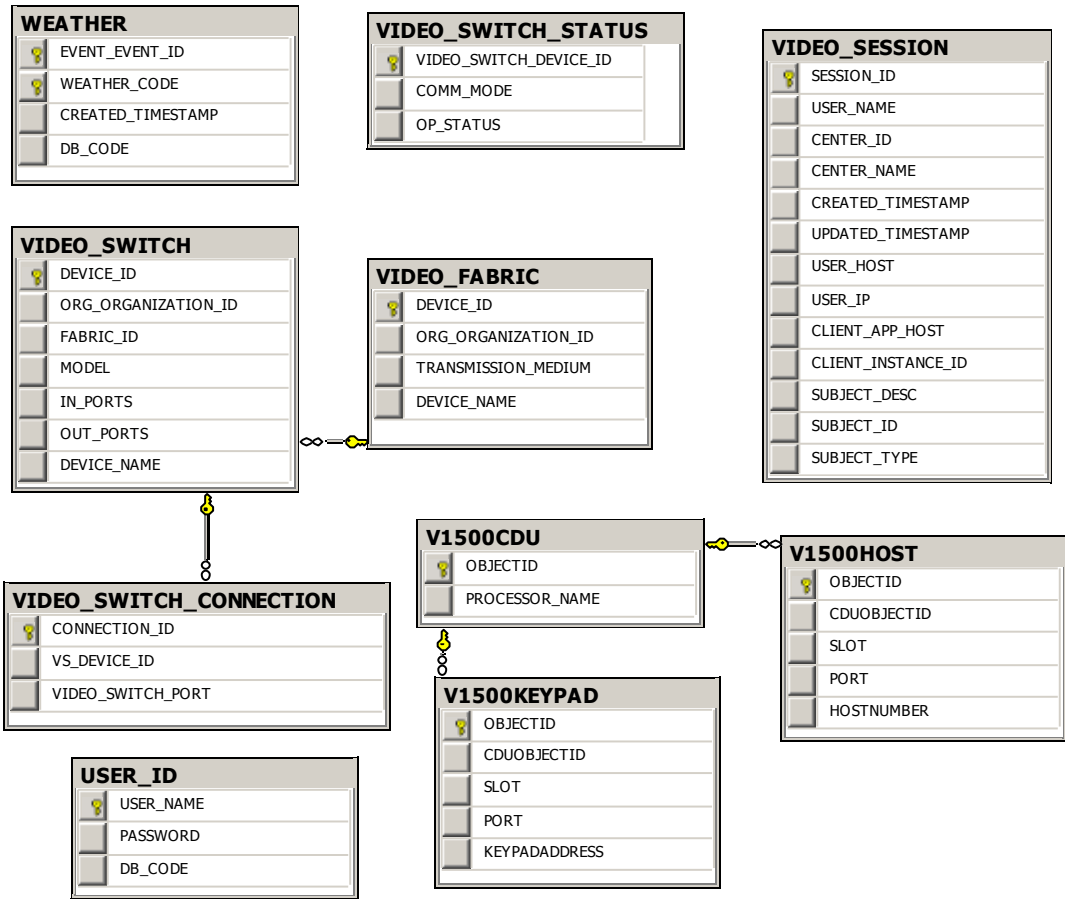
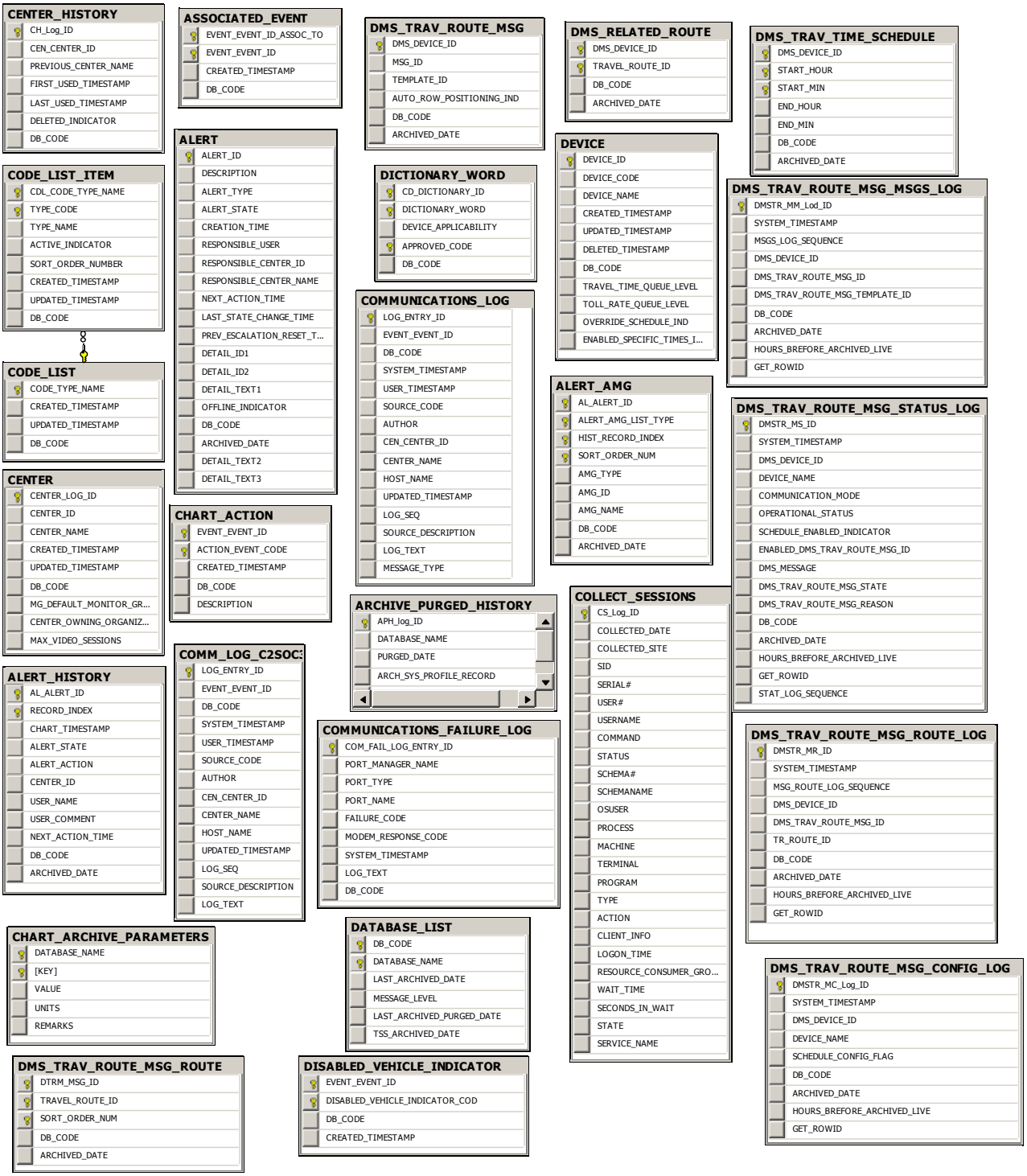
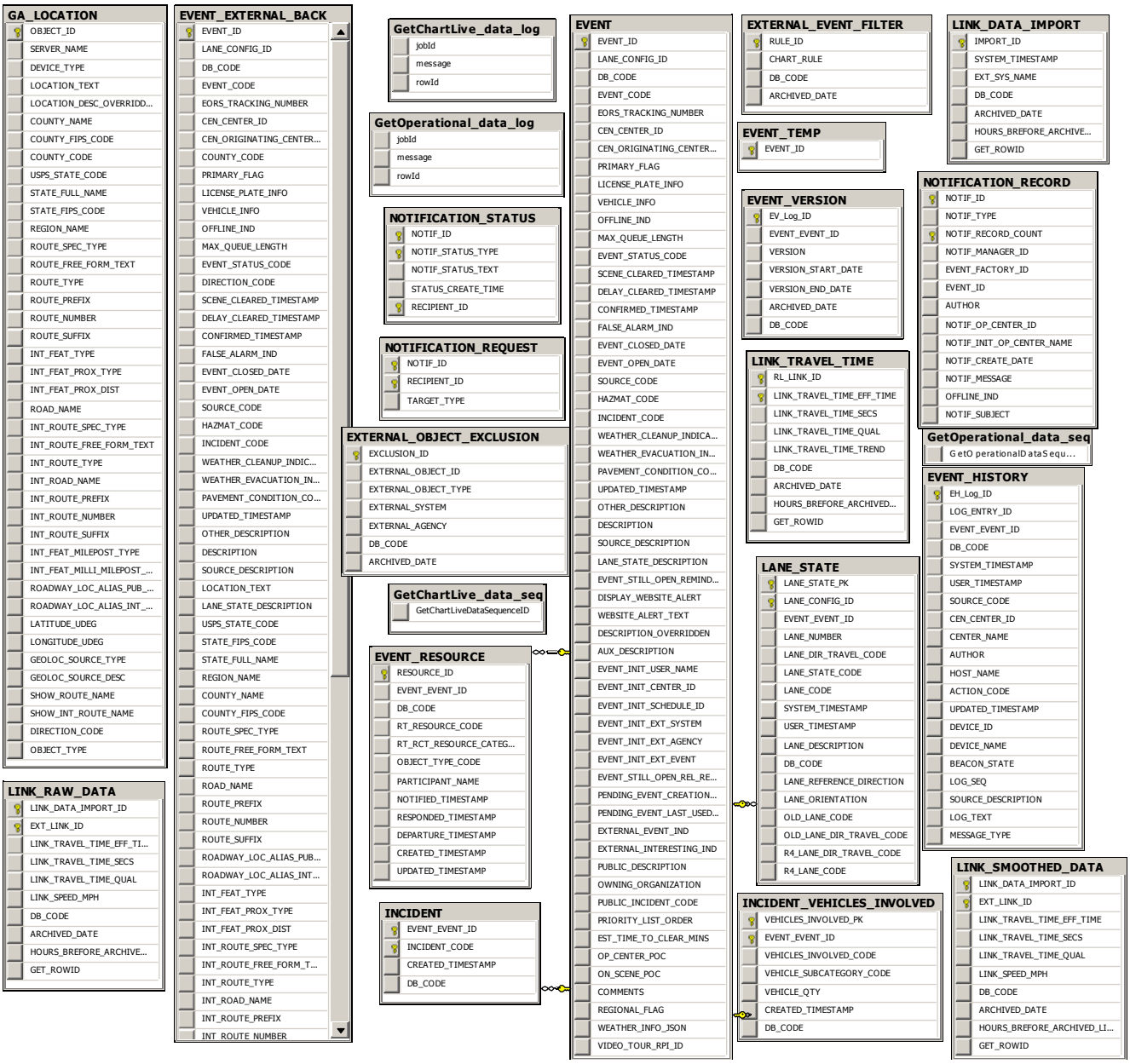


Figure 2-4 CHART R10 ERD

2.4.1.1.2.2 CHART Archive Database Entity Relationship Diagram (ERD)

CHART Archive Database entity relationship diagrams are shown below in the multiple pages of figures labeled collectively as one Figure. These diagrams represent the archive database design prior to R11 and the Table Definition Report sections that follow describe the changes that will be made for R11.

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LONGITUDE_UDEG
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SHOW_INT_ROUTE_NAME
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VEHICLE_INFO
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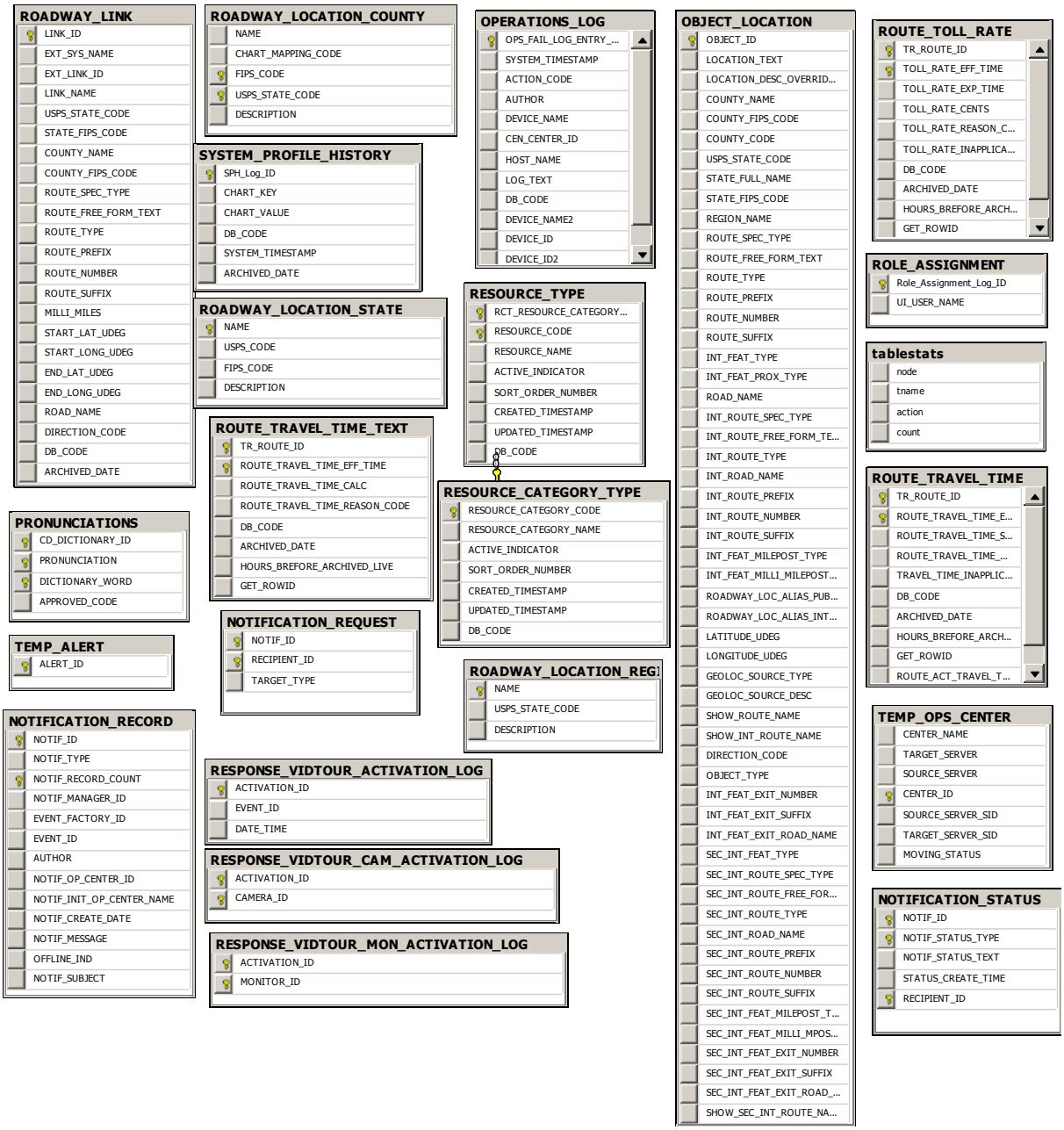
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NAME
USPS_STATE_CODE
DESCRIPTION
OBJECT_LOCATION
OBJECT_ID
LOCATION_TEXT
LOCATION_DESC_OVERRID...
COUNTY_NAME
COUNTY_FIPS_CODE
COUNTY_CODE
USPS_STATE_CODE
STATE_FULL_NAME
STATE_FIPS_CODE
REGION_NAME
ROUTE_SPEC_TYPE
ROUTE_FREE_FORM_TEXT
ROUTE_TYPE
ROUTE_PREFIX
ROUTE_NUMBER
ROUTE_SUFFIX
INT_FEAT_TYPE
INT_FEAT_PROX_TYPE
ROAD_NAME
INT_ROUTE_SPEC_TYPE
INT_ROUTE_FREE_FORM_TE...
INT_ROUTE_TYPE
INT_ROAD_NAME
INT_ROUTE_PREFIX
INT_ROUTE_NUMBER
INT_ROUTE_SUFFIX
INT_FEAT_MILEPOST_TYPE
INT_FEAT_MILLI_MILEPOST...
ROADWAY_LOC_ALIAS_PUB...
ROADWAY_LOC_ALIAS_INT...
LATITUDE_UDEG
LONGITUDE_UDEG
GEOLOC_SOURCE_TYPE
GEOLOC_SOURCE_DESC
SHOW_ROUTE_NAME
SHOW_INT_ROUTE_NAME
DIRECTION_CODE
OBJECT_TYPE
INT_FEAT_EXIT_NUMBER
INT_FEAT_EXIT_SUFFIX
INT_FEAT_EXIT_ROAD_NAME
SEC_INT_FEAT_TYPE
SEC_INT_ROUTE_SPEC_TYPE
SEC_INT_ROUTE_FREE_FOR...
SEC_INT_ROUTE_TYPE
SEC_INT_ROAD_NAME
SEC_INT_ROUTE_PREFIX
SEC_INT_ROUTE_NUMBER
SEC_INT_ROUTE_SUFFIX
SEC_INT_FEAT_MILEPOST_T...
SEC_INT_FEAT_MILLI_MPOS...
SEC_INT_FEAT_EXIT_NUMBER
SEC_INT_FEAT_EXIT_SUFFIX
SEC_INT_FEAT_EXIT_ROAD_...
SHOW_SEC_INT_ROUTE_NA...
ROUTE_TOLL_RATE
TR_ROUTE_ID
TOLL_RATE_EFF_TIME
TOLL_RATE_EXP_TIME
TOLL_RATE_CENTS
TOLL_RATE_REASON_C...
TOLL_RATE_INAPPLICA...
DB_CODE
ARCHIVED_DATE
HOURS_BREFORE_ARCH...
GET_ROWID
ROLE_ASSIGNMENT
Role_Assignment_Log_ID
UI_USER_NAME
tablestats
node
tname
action
count
ROUTE_TRAVEL_TIME
TR_ROUTE_ID
ROUTE_TRAVEL_TIME_E...
ROUTE_TRAVEL_TIME_S...
ROUTE_TRAVEL_TIME_...
TRAVEL_TIME_INAPPLIC...
DB_CODE
ARCHIVED_DATE
HOURS_BREFORE_ARCH...
GET_ROWID
ROUTE_ACT_TRAVEL_T...
TEMP_OPS_CENTER
CENTER_NAME
TARGET_SERVER
SOURCE_SERVER
CENTER_ID
SOURCE_SERVER_SID
TARGET_SERVER_SID
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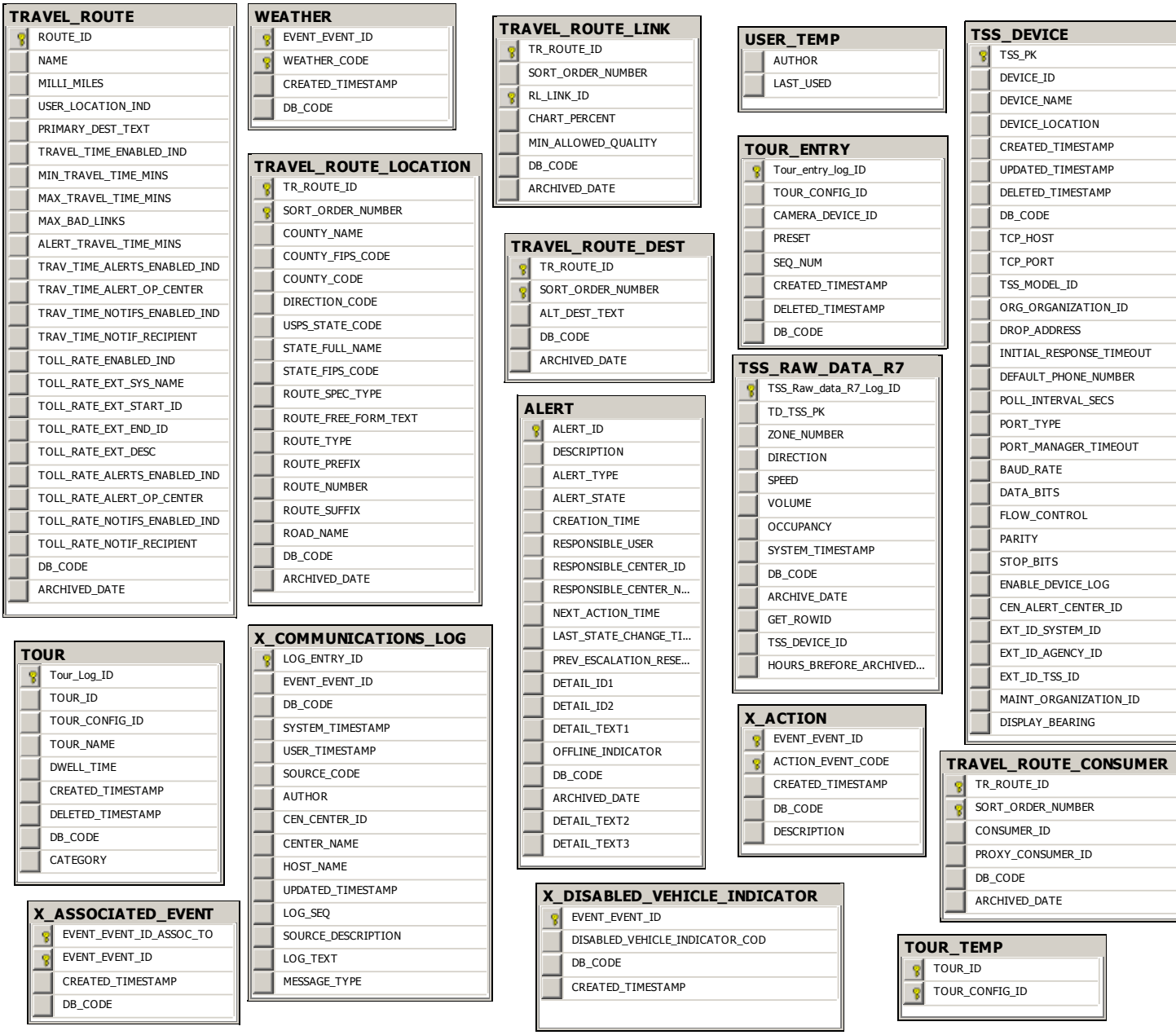
NOTIFICATION_STATUS
NOTIF_ID
NOTIF_STATUS_TYPE
NOTIF_STATUS_TEXT
STATUS_CREATE_TIME
RECIPIENT_ID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ROUTE_ID
NAME
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USER_LOCATION_IND
PRIMARY_DEST_TEXT
TRAVEL_TIME_ENABLED_IND
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MAX_TRAVEL_TIME_MINS
MAX_BAD_LINKS
ALERT_TRAVEL_TIME_MINS
TRAV_TIME_ALERTS_ENABLED_IND
TRAV_TIME_ALERT_OP_CENTER
TRAV_TIME_NOTIFS_ENABLED_IND
TRAV_TIME_NOTIF_RECIPIENT
TOLL_RATE_ENABLED_IND
TOLL_RATE_EXT_SYS_NAME
TOLL_RATE_EXT_START_ID
TOLL_RATE_EXT_END_ID
TOLL_RATE_EXT_DESC
TOLL_RATE_ALERTS_ENABLED_IND
TOLL_RATE_ALERT_OP_CENTER
TOLL_RATE_NOTIFS_ENABLED_IND
TOLL_RATE_NOTIF_RECIPIENT
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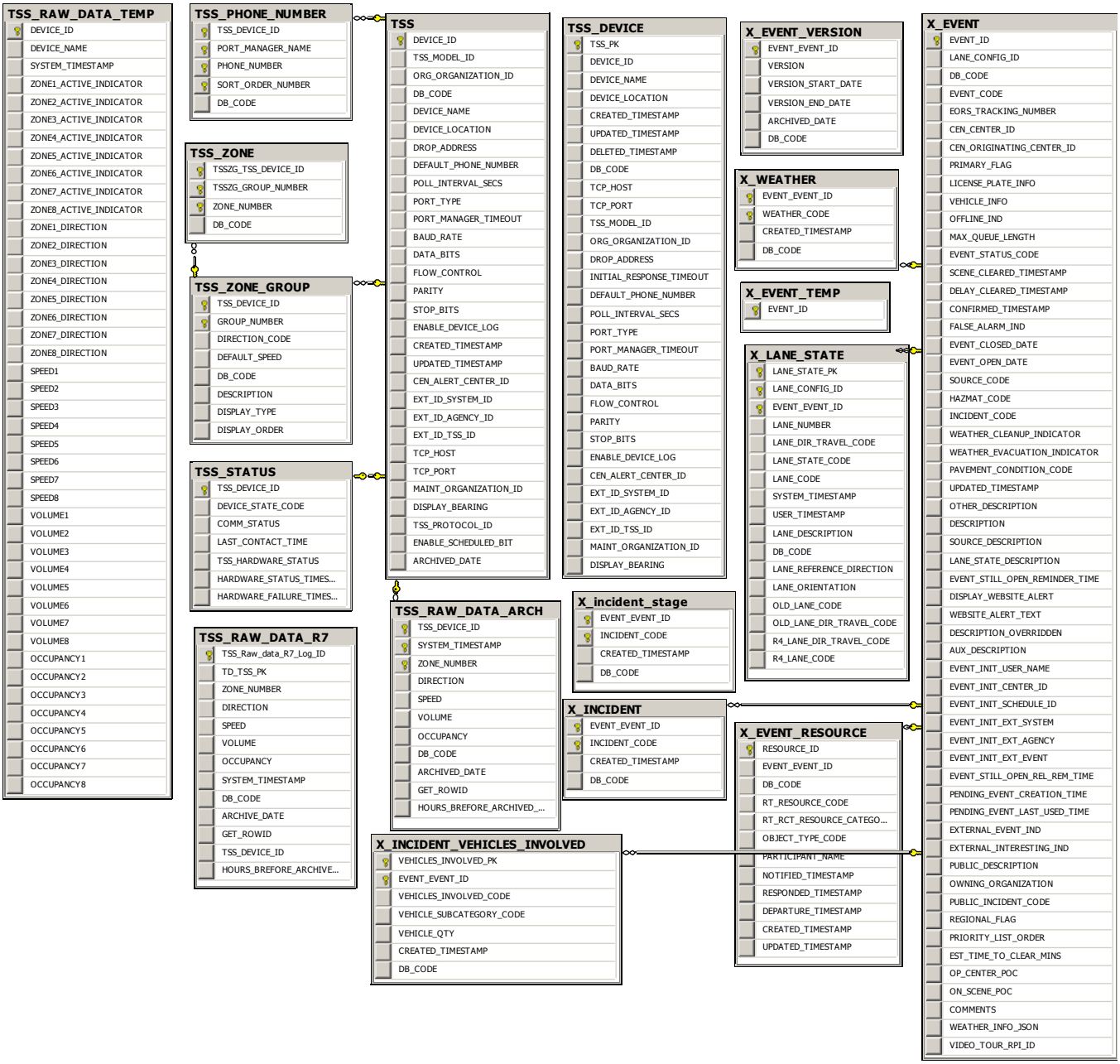
ARCHIVED_DATE
WEATHER
EVENT_EVENT_ID
WEATHER_CODE
CREATED_TIMESTAMP
DB_CODE
TRAVEL_ROUTE_LOCATION
TR_ROUTE_ID
SORT_ORDER_NUMBER
COUNTY_NAME
COUNTY_FIPS_CODE
COUNTY_CODE
DIRECTION_CODE
USPS_STATE_CODE
STATE_FULL_NAME
STATE_FIPS_CODE
ROUTE_SPEC_TYPE
ROUTE_FREE_FORM_TEXT
ROUTE_TYPE
ROUTE_PREFIX
ROUTE_NUMBER
ROUTE_SUFFIX
ROAD_NAME
DB_CODE
ARCHIVED_DATE
TRAVEL_ROUTE_LINK
TR_ROUTE_ID
SORT_ORDER_NUMBER
RL_LINK_ID
CHART_PERCENT
MIN_ALLOWED_QUALITY
DB_CODE
ARCHIVED_DATE
TRAVEL_ROUTE_DEST
TR_ROUTE_ID
SORT_ORDER_NUMBER
ALT_DEST_TEXT
DB_CODE
ARCHIVED_DATE
ALERT
ALERT_ID
DESCRIPTION
ALERT_TYPE
ALERT_STATE
CREATION_TIME
RESPONSIBLE_USER
RESPONSIBLE_CENTER_ID
RESPONSIBLE_CENTER_N...
NEXT_ACTION_TIME
LAST_STATE_CHANGE_TI...
PREV_ESCALATION_RESE...
DETAIL_ID1
DETAIL_ID2
DETAIL_TEXT1
OFFLINE_INDICATOR
DB_CODE
ARCHIVED_DATE
DETAIL_TEXT2
DETAIL_TEXT3
USER_TEMP
AUTHOR
LAST_USED
TOUR_ENTRY
Tour_entry_log_ID
TOUR_CONFIG_ID
CAMERA_DEVICE_ID
PRESET
SEQ_NUM
CREATED_TIMESTAMP
DELETED_TIMESTAMP
DB_CODE
TSS_RAW_DATA_R7
TSS_Raw_data_R7_Log_ID
TD_TSS_PK
ZONE_NUMBER
DIRECTION
SPEED
VOLUME
OCCUPANCY
SYSTEM_TIMESTAMP
DB_CODE
ARCHIVE_DATE
GET_ROWID
TSS_DEVICE_ID
HOURS_BREFORE_ARCHIVED...
X_ACTION
EVENT_EVENT_ID
ACTION_EVENT_CODE
CREATED_TIMESTAMP
DB_CODE
DESCRIPTION
TSS_DEVICE
TSS_PK
DEVICE_ID
DEVICE_NAME
DEVICE_LOCATION
CREATED_TIMESTAMP
UPDATED_TIMESTAMP
DELETED_TIMESTAMP
DB_CODE
TCP_HOST
TCP_PORT
TSS_MODEL_ID
ORG_ORGANIZATION_ID
DROP_ADDRESS
INITIAL_RESPONSE_TIMEOUT
DEFAULT_PHONE_NUMBER
POLL_INTERVAL_SECS
PORT_TYPE
PORT_MANAGER_TIMEOUT
BAUD_RATE
DATA_BITS
FLOW_CONTROL
PARITY
STOP_BITS
ENABLE_DEVICE_LOG
CEN_ALERT_CENTER_ID
EXT_ID_SYSTEM_ID
EXT_ID_AGENCY_ID
EXT_ID_TSS_ID
MAINT_ORGANIZATION_ID
DISPLAY_BEARING
TRAVEL_ROUTE_CONSUMER
TR_ROUTE_ID
SORT_ORDER_NUMBER
CONSUMER_ID
PROXY_CONSUMER_ID
DB_CODE
ARCHIVED_DATE
TOUR
Tour_Log_ID
TOUR_ID
TOUR_CONFIG_ID
TOUR_NAME
DWELL_TIME
CREATED_TIMESTAMP
DELETED_TIMESTAMP
DB_CODE
CATEGORY
X_COMMUNICATIONS_LOG
LOG_ENTRY_ID
EVENT_EVENT_ID
DB_CODE
SYSTEM_TIMESTAMP
USER_TIMESTAMP
SOURCE_CODE
AUTHOR
CEN_CENTER_ID
CENTER_NAME
HOST_NAME
UPDATED_TIMESTAMP
LOG_SEQ
SOURCE_DESCRIPTION
LOG_TEXT
MESSAGE_TYPE
X_DISABLED_VEHICLE_INDICATOR
EVENT_EVENT_ID
DISABLED_VEHICLE_INDICATOR_COD
DB_CODE
CREATED_TIMESTAMP
TOUR_TEMP
TOUR_ID
TOUR_CONFIG_ID
X_ASSOCIATED_EVENT
EVENT_EVENT_ID_ASSOC_TO
EVENT_EVENT_ID
CREATED_TIMESTAMP
DB_CODE


TSS_RAW_DATA_TEMP
DEVICE_ID
DEVICE_NAME
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ZONE1_ACTIVE_INDICATOR
ZONE2_ACTIVE_INDICATOR
ZONE3_ACTIVE_INDICATOR
ZONE4_ACTIVE_INDICATOR
ZONE5_ACTIVE_INDICATOR
ZONE6_ACTIVE_INDICATOR
ZONE7_ACTIVE_INDICATOR
ZONE8_ACTIVE_INDICATOR
ZONE1_DIRECTION
ZONE2_DIRECTION
ZONE3_DIRECTION
ZONE4_DIRECTION
ZONE5_DIRECTION
ZONE6_DIRECTION
ZONE7_DIRECTION
ZONE8_DIRECTION
SPEED1
SPEED2
SPEED3
SPEED4
SPEED5
SPEED6
SPEED7
SPEED8
VOLUME1
VOLUME2
VOLUME3
VOLUME4
VOLUME5
VOLUME6
VOLUME7
VOLUME8
OCCUPANCY1
OCCUPANCY2
OCCUPANCY3
OCCUPANCY4
OCCUPANCY5
OCCUPANCY6
OCCUPANCY7
OCCUPANCY8
TSS_PHONE_NUMBER
TSS_DEVICE_ID
PORT_MANAGER_NAME
PHONE_NUMBER
SORT_ORDER_NUMBER
DB_CODE
TSS_ZONE
TSSZG_TSS_DEVICE_ID
TSSZG_GROUP_NUMBER
ZONE_NUMBER
DB_CODE
TSS_ZONE_GROUP
TSS_DEVICE_ID
GROUP_NUMBER
DIRECTION_CODE
DEFAULT_SPEED
DB_CODE
DESCRIPTION
DISPLAY_TYPE
DISPLAY_ORDER
TSS_STATUS
TSS_DEVICE_ID
DEVICE_STATE_CODE
COMM_STATUS
LAST_CONTACT_TIME
TSS_HARDWARE_STATUS
HARDWARE_STATUS_TIMES...
HARDWARE_FAILURE_TIMES...
TSS_RAW_DATA_R7
TSS_Raw_data_R7_Log_ID
TD_TSS_PK
ZONE_NUMBER
DIRECTION
SPEED
VOLUME
OCCUPANCY
SYSTEM_TIMESTAMP
DB_CODE
ARCHIVE_DATE
GET_ROWID
TSS_DEVICE_ID
HOURS_BREFORE_ARCHIVE...
TSS
DEVICE_ID
TSS_MODEL_ID
ORG_ORGANIZATION_ID
DB_CODE
DEVICE_NAME
DEVICE_LOCATION
DROP_ADDRESS
DEFAULT_PHONE_NUMBER
POLL_INTERVAL_SECS
PORT_TYPE
PORT_MANAGER_TIMEOUT
BAUD_RATE
DATA_BITS
FLOW_CONTROL
PARITY
STOP_BITS
ENABLE_DEVICE_LOG
CREATED_TIMESTAMP
UPDATED_TIMESTAMP
CEN_ALERT_CENTER_ID
EXT_ID_SYSTEM_ID
EXT_ID_AGENCY_ID
EXT_ID_TSS_ID
TCP_HOST
TCP_PORT
MAINT_ORGANIZATION_ID
DISPLAY_BEARING
TSS_PROTOCOL_ID
ENABLE_SCHEDULED_BIT
ARCHIVED_DATE
TSS_RAW_DATA_ARCH
TSS_DEVICE_ID
SYSTEM_TIMESTAMP
ZONE_NUMBER
DIRECTION
SPEED
VOLUME
OCCUPANCY
DB_CODE
ARCHIVED_DATE
GET_ROWID
HOURS_BREFORE_ARCHIVED_...
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VEHICLES_INVOLVED_PK
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VEHICLES_INVOLVED_CODE
VEHICLE_SUBCATEGORY_CODE
VEHICLE_QTY
CREATED_TIMESTAMP
DB_CODE
TSS_DEVICE
TSS_PK
DEVICE_ID
DEVICE_NAME
DEVICE_LOCATION
CREATED_TIMESTAMP
UPDATED_TIMESTAMP
DELETED_TIMESTAMP
DB_CODE
TCP_HOST
TCP_PORT
TSS_MODEL_ID
ORG_ORGANIZATION_ID
DROP_ADDRESS
INITIAL_RESPONSE_TIMEOUT
DEFAULT_PHONE_NUMBER
POLL_INTERVAL_SECS
PORT_TYPE
PORT_MANAGER_TIMEOUT
BAUD_RATE
DATA_BITS
FLOW_CONTROL
PARITY
STOP_BITS
ENABLE_DEVICE_LOG
CEN_ALERT_CENTER_ID
EXT_ID_SYSTEM_ID
EXT_ID_AGENCY_ID
EXT_ID_TSS_ID
MAINT_ORGANIZATION_ID
DISPLAY_BEARING
X_incident_stage
EVENT_EVENT_ID
INCIDENT_CODE
CREATED_TIMESTAMP
DB_CODE
X_INCIDENT
EVENT_EVENT_ID
INCIDENT_CODE
CREATED_TIMESTAMP
DB_CODE
X_EVENT_VERSION
EVENT_EVENT_ID
VERSION
VERSION_START_DATE
VERSION_END_DATE
ARCHIVED_DATE
DB_CODE
X_WEATHER
EVENT_EVENT_ID
WEATHER_CODE
CREATED_TIMESTAMP
DB_CODE
X_EVENT_TEMP
EVENT_ID
X_LANE_STATE
LANE_STATE_PK
LANE_CONFIG_ID
EVENT_EVENT_ID
LANE_NUMBER
LANE_DIR_TRAVEL_CODE
LANE_STATE_CODE
LANE_CODE
SYSTEM_TIMESTAMP
USER_TIMESTAMP
LANE_DESCRIPTION
DB_CODE
LANE_REFERENCE_DIRECTION
LANE_ORIENTATION
OLD_LANE_CODE
OLD_LANE_DIR_TRAVEL_CODE
R4_LANE_DIR_TRAVEL_CODE
R4_LANE_CODE
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RESOURCE_ID
EVENT_EVENT_ID
DB_CODE
RT_RESOURCE_CODE
RT_RCT_RESOURCE_CATEGO...
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PARTICIPANT_NAME
NOTIFIED_TIMESTAMP
RESPONDED_TIMESTAMP
DEPARTURE_TIMESTAMP
CREATED_TIMESTAMP
UPDATED_TIMESTAMP
X_EVENT
EVENT_ID
LANE_CONFIG_ID
DB_CODE
EVENT_CODE
EORS_TRACKING_NUMBER
CEN_CENTER_ID
CEN_ORIGINATING_CENTER_ID
PRIMARY_FLAG
LICENSE_PLATE_INFO
VEHICLE_INFO
OFFLINE_IND
MAX_QUEUE_LENGTH
EVENT_STATUS_CODE
SCENE_CLEARED_TIMESTAMP
DELAY_CLEARED_TIMESTAMP
CONFIRMED_TIMESTAMP
FALSE_ALARM_IND
EVENT_CLOSED_DATE
EVENT_OPEN_DATE
SOURCE_CODE
HAZMAT_CODE
INCIDENT_CODE
WEATHER_CLEANUP_INDICATOR
WEATHER_EVACUATION_INDICATOR
PAVEMENT_CONDITION_CODE
UPDATED_TIMESTAMP
OTHER_DESCRIPTION
DESCRIPTION
SOURCE_DESCRIPTION
LANE_STATE_DESCRIPTION
EVENT_STILL_OPEN_REMINDER_TIME
DISPLAY_WEBSITE_ALERT
WEBSITE_ALERT_TEXT
DESCRIPTION_OVERRIDDEN
AUX_DESCRIPTION
EVENT_INIT_USER_NAME
EVENT_INIT_CENTER_ID
EVENT_INIT_SCHEDULE_ID
EVENT_INIT_EXT_SYSTEM
EVENT_INIT_EXT_AGENCY
EVENT_INIT_EXT_EVENT
EVENT_STILL_OPEN_REL_REM_TIME
PENDING_EVENT_CREATION_TIME
PENDING_EVENT_LAST_USED_TIME
EXTERNAL_EVENT_IND
EXTERNAL_INTERESTING_IND
PUBLIC_DESCRIPTION
OWNING_ORGANIZATION
PUBLIC_INCIDENT_CODE
REGIONAL_FLAG
PRIORITY_LIST_ORDER
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OP_CENTER_POC
ON_SCENE_POC
COMMENTS
WEATHER_INFO_JSON
VIDEO_TOUR_RPI_ID

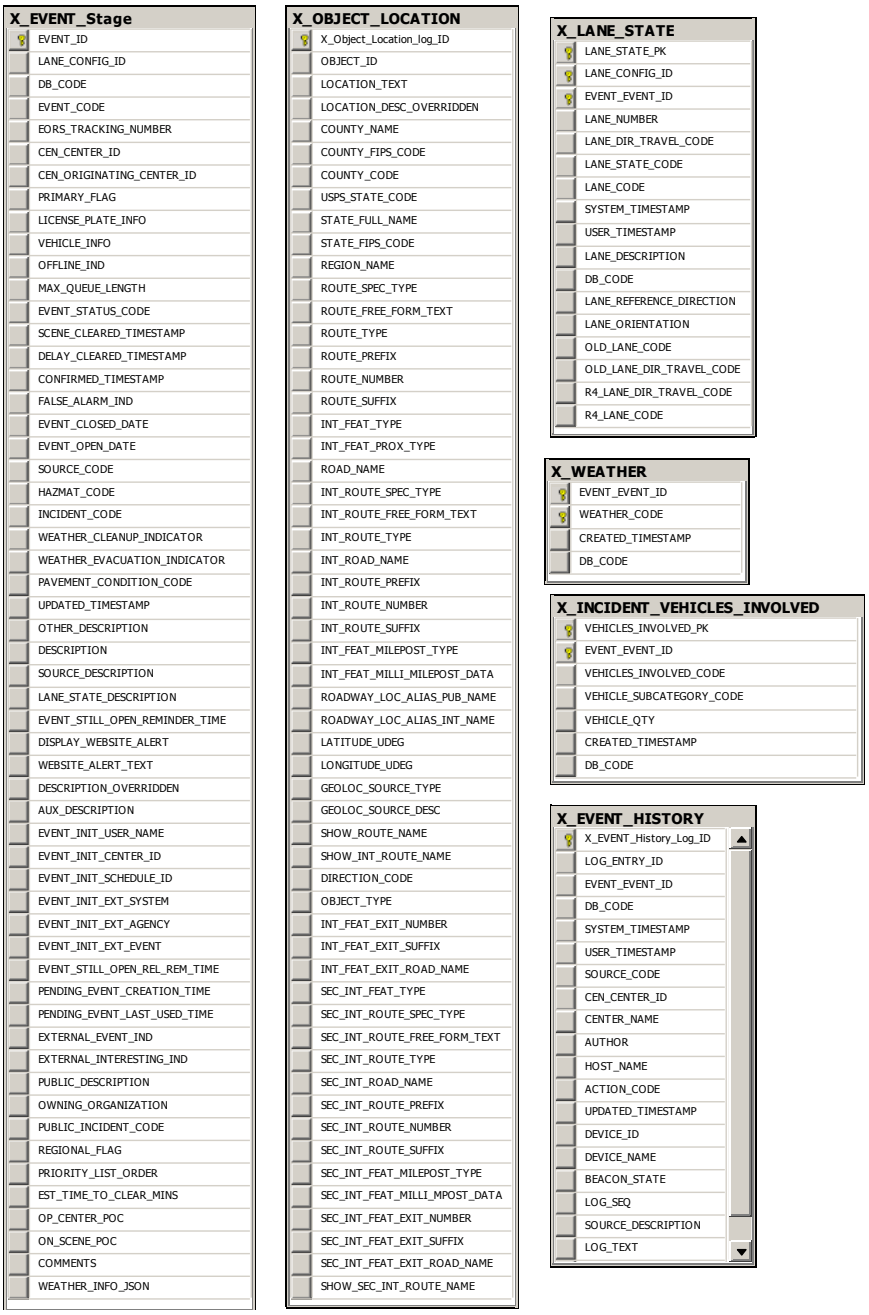


Figure 2-5 CHART R10 Archive Database ERD

2.4.1.1.2.3 Function to Entity Matrix Report

The Create, Retrieve, Update, Delete (CRUD) matrix cross-references business functions to entities and shows the use of the entities by those functions. This report will be generated as part of the CHART O&M Guide.

2.4.1.1.2.4 Table Definition Report –

In tables shown below:

- Deleted columns/constraints marked with a minus sign ("-")
- Modified columns/constraints marked with an asterisk ("*")
- New columns/constraints marked with a plus sign ("+")

2.4.1.1.2.4.1 Tables Modified for the Participants/AVL Feature

2.4.1.1.2.4.1.1 CHART DB

The R11 Participants/AVL feature requires six new tables and the modification of the existing EVENT table. Four existing tables will be removed.

Removed Tables:
EVENT_PARTICIPANT
EVENT_RESOURCE
RESOURCE_TYPE
RESOURCE_CATEGORY_TYPE

EVENT_RESOURCE_TYPE Table (New):
Rights: The TRAFFICEVENTSERVICE user requires full C/R/U/D rights for this table.

This new table stores information about event resource types that have been defined in the system.

EVENT_RESOURCE_TYPE Columns:

+EVENT_RESOURCE_TYPE_ID	CHAR(32)	NOT NULL
+NAME	VARCHAR(128)	NOT NULL
+CATEGORY	VARCHAR(128)	NOT NULL
+DEFAULT_AVL_SUPPORT	NUMERIC(1)	NOT NULL
+DEFAULT_UNIT_NAME_SUPPORT	NUMERIC(1)	NOT NULL
+DEFAULT_IN_SERVICE_SUPPORT	NUMERIC(1)	NOT NULL
+DEFAULT_CAMERA_SUPPORT	NUMERIC(1)	NOT NULL
+SHOW_AVL_ONLY_RESOURCES_AS_TYPE	NUMERIC(1)	NOT NULL
+AVL_AUTOCONFIG_VEH_TYPE	VARCHAR(128)	NULL
+ALL_OP_CENTERS	NUMERIC(1)	NOT NULL
+ICON_IN_SERVICE	VARBINARY	NULL
+ICON_IN_SERVICE_WIDTH	NUMERIC(4)	NULL

+ICON_IN_SERVICE_HEIGHT	NUMERIC(4)	NULL
+ICON_IN_SERVICE_ORIG_FILE_NAME	VARCHAR(255)	NULL
+ICON_IN_SERVICE_WITH_CAMERA	VARBINARY	NULL
+ICON_IN_SERVICE_WITH_CAMERA_WIDTH	NUMERIC(4)	NULL
+ICON_IN_SERVICE_WITH_CAMERA_HEIGHT	NUMERIC(4)	NULL
+ICON_IN_SERVICE_WITH_CAMERA_ORIG_FILE_NAME	VARCHAR(255)	NULL
+ICON_OUT_OF_SERVICE	VARBINARY	NULL
+ICON_OUT_OF_SERVICE_WIDTH	NUMERIC(4)	NULL
+ICON_OUT_OF_SERVICE_HEIGHT	NUMERIC(4)	NULL
+ICON_OUT_OF_SERVICE_ORIG_FILE_NAME	VARCHAR(255)	NULL
+REMOVED	NUMERIC(1)	NOT NULL
+OFFLINE_IND	NUMERIC(1)	NOT NULL

PRIMARY KEY: EVENT_RESOURCE_TYPE_ID

EVENT_RESOURCE Table (New):
Rights: The TRAFFICEVENTSERVICE user requires full C/R/U/D rights for this table.

This new table stores information about event resources that have been defined in the system.

EVENT_RESOURCE Columns:

+EVENT_RESOURCE_ID	CHAR(32)	NOT NULL
+ERT_EVENT_RESOURCE_TYPE_ID	CHAR(32)	NOT NULL
+AVL_SUPPORT	NUMERIC(1)	NOT NULL
+AVL_VEHICLE_ID	VARCHAR(128)	NULL
+AVL_DRIVERID	VARCHAR(128)	NULL
+AVL_AUTO_CONFIGURED	NUMERIC(1)	NULL
+UNIT_NAME_SUPPORT	NUMERIC(1)	NOT NULL
+UNIT_NAME	VARCHAR(128)	NULL
+IN_SERVICE_SUPPORT	NUMERIC(1)	NOT NULL
+IN_SERVICE	NUMERIC(1)	NULL
+CAMERA_SUPPORT	NUMERIC(1)	NOT NULL
+CAMERA_ID	CHAR(32)	NULL
+ALL_OP_CENTERS	NUMERIC(1)	NOT NULL
+REMOVED	NUMERIC(1)	NOT NULL
+OFFLINE_IND	NUMERIC(1)	NOT NULL

PRIMARY KEY: EVENT_RESOURCE_ID
FOREIGN KEY: ERT_EVENT_RESOURCE_TYPE_ID

CENTER_EVENT_RESOURCE_TYPE Table (New):
Rights: The TRAFFICEVENTSERVICE user requires full C/R/U/D rights for this table.

This new table associates event resource types with operations centers.

CENTER_EVENT_RESOURCE_TYPE Columns:

+CEN_CENTER_ID	CHAR(32)	NOT NULL
+ERT_EVENT_RESOURCE_TYPE_ID	CHAR(32)	NOT NULL

PRIMARY KEY: CEN_CENTER_ID, ERT_EVENT_RESOURCE_TYPE_ID
FOREIGN KEY: CEN_CENTER_ID
FOREIGN KEY: ERT_EVENT_RESOURCE_TYPE_ID

CENTER_EVENT_RESOURCE Table (New):
Rights: The TRAFFICEVENTSERVICE user requires full C/R/U/D rights for this table.

This new table associates event resources with operations centers.

CENTER_EVENT_RESOURCE Columns:

+CEN_CENTER_ID	CHAR(32)	NOT NULL
+ER_EVENT_RESOURCE_ID	CHAR(32)	NOT NULL

PRIMARY KEY: CEN_CENTER_ID, ER_EVENT_RESOURCE_ID
FOREIGN KEY: CEN_CENTER_ID
FOREIGN KEY: ER_EVENT_RESOURCE_ID

EVENT_PARTICIPATION Table (New):
Rights: The TRAFFICEVENTSERVICE user requires full C/R/U/D rights for this table.

This new table contains information for participants that are assigned to traffic events.

EVENT_PARTICIPATION Columns:

+EVENT_EVENT_ID	CHAR(32)	NOT NULL
+EVENT_PARTICIPATION_ID	CHAR(32)	NOT NULL
+PARTICIPANT_TYPE	NUMBER(1)	NOT NULL
+PARTICIPANT_ID	CHAR(32)	NOT NULL
+ORIGINAL_PARTICIPANT_TYPE	NUMBER(1)	NOT NULL
+ORIGINAL_PARTICIPANT_ID	CHAR(32)	NOT NULL
+PARTICIPANT_CHANGED_BY_USER	NUMBER(1)	NOT NULL
+NOTIFIED_TIMESTAMP	DATETIME2	NULL
+ARRIVED_RESPONDED_TIMESTAMP	DATETIME2	NULL
+DEPARTED_TIMESTAMP	DATETIME2	NULL
+AUTO_AVL_DETECTION_ENABLED	NUMBER(1)	NOT NULL
+CALL_SIGN	VARCHAR(128)	NULL
+DRIVER_FIRST_NAME	VARCHAR(128)	NULL
+DRIVER_LAST_NAME	VARCHAR(128)	NULL

+NOTE VARCHAR(128) NULL

PRIMARY KEY: EVENT_PARTICIPATION_ID
FOREIGN KEY: EVENT_EVENT_ID

AVL_VEHICLE Table (New):
Rights: The TRAFFICEVENTSERVICE user requires full C/R/U/D rights for this table.

This new table contains information about vehicles discovered in the AVL system. The vehicles are persisted to allow the traffic event service to detect additions, subtractions, and changes that may occur when the traffic event service is not running.

AVL_VEHICLE Columns:

+AVL_VEHICLE_ID	VARCHAR(100)	NOT NULL
+AVL_DRIVER_ID	VARCHAR (100)	NOT NULL
+LAST_UPDATE	DATETIME2	NOT NULL

PRIMARY KEY: AVL_VEHICLE_ID

EVENT Table (Changed):

This table is changed to store a new flag that indicates if automatic AVL detection features are enabled for a traffic event.

+AUTO_AVL_DETECTION_ENABLED NUMBER(1) NOT NULL

CODE_LIST Table New Values:

CODE_TYPE_NAME
Feature Support Level
Participant Type

CODE_LIST_ITEM Table New Values:

CDL_CODE_TYPE_NAME	TYPE_CODE	TYPE_NAME	ACTIVE_INDICATOR
Feature Support Level	0	None	1
Feature Support Level	1	Allowed	1
Feature Support Level	2	Required	1
Participant Type	0	Event Resource	1
Participant Type	1	Event Resource Type	1

2.4.1.1.2.4.2 Tables Modified for the Traffic Signal Integration Feature

2.4.1.1.2.4.2.1 CHART DB

ASSOCIATED_TRAFFIC_SIGNAL Table (New For R11):
Rights: This table will need full C/R/U/D rights for the TRAFFICEVENTSERVICE user.

This table stores the data describing each Traffic Signal that is currently associated with an Action Event in the system.

ASSOCIATED_TRAFFIC_SIGNAL Columns:

+EVENT_EVENT_ID_ASSOC_TO	CHAR(32) NOT NULL
+SIGNAL_ID	CHAR (32) NOT NULL
+SIGNAL_DESC	VARCHAR(200) NOT NULL
+USER_DEFINED_FLAG	NUMERIC(1,0) NOT NULL

PRIMARY KEY: EVENT_EVENT_ID_ASSOC_TO, SIGNAL_ID

New code list items for new Action Required 11 codes.

CODE_LIST_ITEM Table New Values:

CDL_CODE_TYPE_NAME	TYPE_CODE	TYPE_NAME	ACTIVE_INDICATOR
Action Event	22	Signal Red Arrow Out 11-5 RA	1
Action Event	23	Walk Sign Out 11-5 W	1
Action Event	24	Don't Walk Sign Out 11-5 DW	1

2.4.1.1.2.4.3 Tables Modified for the Decision Support Feature

The R11 HAR Decision Support feature requires one new table and modification of the existing DMS, HAR, and DS_MSG_TEMPL_FILTER tables.

CHART DB DMS Table (Changed):
Rights: Existing table. Rights remain the same.

This table stores the main data describing each DMS in the system. The DEVICE_ID column is the primary key for this table. The table is being modified for R11 to include a column storing a flag that indicates if the DMS is eligible for decision support message suggestions.

DMS Columns:

+DS_ELIGIBLE NUMERIC(1,0) NOT NULL

CHART DB HAR Table (Changed):

Rights: Existing table. Rights remain the same.

This table stores the main data describing each HAR in the system. The DEVICE_ID column is the primary key for this table. The table is being modified for R11 to include a column storing a flag that indicates if the HAR is eligible for decision support message suggestions.

HAR Columns:

+DS_ELIGIBLE NUMERIC(1,0) NOT NULL

CHART DB DS_HAR_MSG_TEMPLATE Table (New):
Rights: This table will need full C/R/U/D rights for the MESSAGEUTILITYSERVICE user.

This table stores the main data describing each decision support HAR message template in the system. It stores the unique ID for each template (primary key), a descriptive string, and the message text (with decision support tags embedded).

DS_HAR_MSG_TEMPLATE Columns:

+MESSAGE_TEMPLATE_ID	CHAR(32)	NOT NULL
+TEMPLATE_DESCRIPTION	VARCHAR(50)	NOT NULL,
+TEMPLATE_MESSAGE	VARCHAR2(1024)	NOT NULL

PRIMARY KEY: MESSAGE_TEMPLATE_ID

CHART DB DS_MSG_TEMPL_FILTER Table (Changed):
Rights: Existing table. Rights remain the same.

This table stores the filter criteria for each template stored in either the DS_DMS_MSG_TEMPLATE table or the DS_HAR_MSG_TEMPLATE table. The MSG_TEMPLATE_ID and FILTER_TYPE_ID columns form the primary key for this table. For each message template, there will be one or more rows in this table for each supported filter type in the DS_MSG_TEMPL_FILTER_TYPES table. The table is being modified for R11 to include a column storing the type of decision support template for which the filter applies. The values for the template type will be listed in the code list tables.

DS_MSG_TEMPL_FILTER Columns:

+TEMPLATE_TYPE NUMERIC(3,0)

CODE_LIST Table New Values:

CODE_TYPE_NAME
DS_TEMPLATE_TYPE

CODE_LIST_ITEM Table New Values:

CDL_CODE_TYPE_NAME	TYPE_CODE	TYPE_NAME	ACTIVE_INDICATOR
DS_TEMPLATE_TYPE	0	DMS	1
DS_TEMPLATE_TYPE	1	HAR	1

2.4.1.1.2.4.4 Tables Modified for the Send Notification Enhancements Feature

The Send Notification Enhancements feature does not require any new tables or changes to existing tables. No tables are being removed. All database related changes for this feature are data only changes; several new rows will be added to the SYSTEM_PROFILE table. The rows will be to support the Facilities drop down (one row for each facility defined by the system administrator) and two rows to store the all lanes closed / all lanes opened abbreviations.

2.4.1.1.2.5 PL/SQL Module Definition and Database Trigger Reports

There are no new PL/SQL modules for CHART R11.

2.4.1.1.2.6 Database Size Estimate - provides size estimate of current design

CHART R11 will cause an increase in the size of the CHART database due to the storage of EVENT_RESOURCE records for resources that are automatically added to CHART when discovered in the AVL system. Furthermore, a row will exist in the AVL_VEHICLE table for each AVL vehicle discovered in the AVL system. At the current time, the estimate is for there to eventually be 10,000 EVENT_RESOURCE records and 10,000 AVL_VEHICLE records, assuming each AVL vehicle will be associated with an EVENT_RESOURCE in CHART.

The Send Notification Enhancements feature will not significantly increase the size of the CHART database.

2.4.1.1.2.7 Data Distribution

There are no changes to data distribution for R11.

2.4.1.1.2.8 Database Replication

Database replication is not used in R11. If it were to be desired to run multiple instances of the Traffic Event Service, the EVENT_RESOURCE, EVENT_RESOURCE_TYPE, CENTER_EVENT_RESOURCE, and CENTER_EVENT_RESOURCE_TYPE tables would need to be replicated, and code changes would be needed to allow the EventResourceManager objects inside the Traffic Event Service to stay in synch.

2.4.1.1.2.9 Database Failover Strategy

The database failover strategy is defined as part of Work Order 27. There are no changes to the database failover strategy for R11.

2.4.1.1.2.10 Reports

No reports will be added or updated for R11. Since R5, the CHART reporting function has been transferred to University of Maryland.

2.4.1.2 CHART Flat Files

The following describes the use of flat files in CHART.

2.4.1.2.1 Service Registration Files

There are no new Java services and therefore no new service registration files for CHART R11.

2.4.1.2.2 Service Property Files

Except as noted, there are no new service property files for CHART R11.

2.4.1.2.3 GUI Property Files

There are only minor updates to the GUI properties file in its WEB-INF directory for CHART R11.

2.4.1.2.4 Arbitration Queue Storage Files

The Arbitration Queue Storage Files were retired as of release R9S.

2.4.1.2.5 Device Logs

There are no changes to Device Log Files for R11.

2.4.1.2.6 Service Process Logs

All CHART services write to a process log, used to provide a historical record of activity undertaken by the services. These logs are occasionally referenced by software engineering personnel to diagnose a problem or reconstruct a sequence of events leading to a particular anomalous situation. These logs are automatically deleted by the system after a set period of time defined by the service's properties file, so they do not accumulate infinitely. These files are stored in the individual service directories and are named by the service name and date, plus a "`.txt`" extension. These logs are typically read only by software engineering personnel. Except where noted, there are no changes for service process logs for R11 features.

2.4.1.2.7 Service Error Logs

All CHART services write to an error log, used to provide detail on certain errors encountered by the services. Most messages, including most errors, are captured by the CHART software and written to the process logs, but certain messages (typically produced by the Java Virtual Machine itself, by COTS, or DLLs) cannot be captured by CHART Software and instead are captured in these "catch-all" logs. Errors stored in these logs are typically problems resulting from a bad installation; once the system is up and running, errors rarely appear in these error logs. Debugging information from the JacORB COTS, which is not usually indicative of errors, can routinely be found in these error logs, as well. These log files can be reviewed by software engineering personnel to diagnose an installation problem or other type of problem. These logs are automatically deleted by the system after a set period of time defined by the service's properties file, so they do not accumulate infinitely. These files are stored in the individual service directories and are named by the service name and date, plus an ".err" extension. These logs are typically read only by software engineering personnel. Except where noted, there are no changes for service error logs for R10 features.

2.4.1.2.8 GUI Process Logs

Like the CHART background services, the CHART GUI service also writes to a process log file, used to provide a historical record of activity undertaken by the process. These GUI process logs are occasionally referenced by software engineering personnel to diagnose a problem or reconstruct a sequence of events leading to a particular anomalous situation. These logs are automatically deleted by the system after a set period of time defined by the GUI service's properties file, so they do not accumulate infinitely. These files are stored in the `chartlite/LogFiles/` directory under the `WebApps/` directory in the Apache Tomcat installation area. They are named by the service name ("`chartlite`") and date, plus a "`.txt`" extension. These logs are typically read only by software engineering personnel. Additional log files written by the Apache Tomcat system itself are stored in the `log/` directory in the Apache Tomcat installation area.

- R11 GUI changes do not change the way the GUI process logs operate.

2.4.1.2.9 FMS Port Configuration Files

The CHART Communications Services read a Port Configuration file, typically named `PortConfig.xml`, upon startup, which indicates which ports are to be used by the service and how they are to be initialized. A Port Configuration Utility is provided which allows for addition, removal of ports and editing of initialization parameters. As indicated by the extension, these files are in XML format. This means these files are hand-editable, although the Port Configuration Utility allows for safer, more controlled editing. The Port Configuration files are typically modified only by software engineers or telecommunications engineers.

- There are no changes to this section for any of the R11 features.

2.4.1.2.10 Watchdog Configuration Files

There are no changes to the Watchdog configuration files for any of the R11 features.

2.4.2 Database Design

Changes made to the CHART database design for Release 11 features are described below.

2.4.2.1 Paricipants/AVL

2.4.2.1.1 CHART DB

The R11 Participants/AVL feature will require new tables to be added, require changes to an existing table, and will remove some tables that are no longer needed. See the details described in section 2.4.1.1.2.4.1 above.

2.4.2.2 Traffic Signal Integration

2.4.2.2.1 CHART DB

The R11 Traffic Signals Integration feature will require one new table to be added. See the details described in section 2.4.1.1.2.4.2 above.

2.4.2.3 Decision Support

The R11 HAR Decision Support feature will require a new table to be added and require changes to 3 existing tables. See the details described in section 2.4.1.1.2.4.3 above.

2.4.2.4 Send Notification Enhancements

2.4.2.4.1 CHART DB

The Send Notification Enhancements feature does not require any changes to the CHART database design.

2.4.2.5 Archiving - Changes

The CHART Archive database stores data from the CHART operational system as part of a permanent archive. The CHART Archive database design is a copy of the CHART operational system for those tables containing system, alert, traveler information messages and their underlying data, and event log information. In addition, the CHART Archive database stores detector data. In R11, the archive will be changed to include the new event resource related data as specified in section 2.4.1.1.2.4.1 above. Additionally, the archive process will be responsible for removing event resources and types from the CHART database that are marked as “offline” after it has properly archived these items, which have been removed from the CHART system and are no longer in use by any online traffic events.

3 Key Design Concepts

3.1 Participants / AVL

Support for the Participants / AVL feature will be added to the CHART server in the existing TrafficEventModule. A new CORBA accessible object that provides for the management of event resources and types will be added to the module, in addition to an object that interfaces with the AVL system. By including these new objects in the same module, processing efficiency will be gained by allowing them to share data via "in process" objects, rather than requiring CORBA or Web Service calls. This processing efficiency is required due to the large number of AVL vehicles and event resources that may exist in the system. Java interfaces will be used to keep these objects loosely coupled within the module.

When AVL data is retrieved from the AVL service, the AVLDataManager object will update location data in memory and then call the EventResourceManager object (via its AVLDataListener interface), which will associate the AVL data with event resources based on the AVL vehicle ID. The EventResourceManager will then call the TrafficEventFactory (via its EventResourceListener interface) to notify it that event resource locations have changed and allow it to do its automatic AVL detection processing. All of this location based processing will access the same exact Java objects in memory, eliminating the need to pass large volumes of location data amongst various modules in the server.

When the TrafficEventFactory is notified that event resource locations have been updated, it will perform its automatic AVL detection processing, provided this feature is enabled in the system profile. There are three distinct types of detection that will be attempted for each applicable traffic event participant, provided automatic AVL detection is enabled for the traffic event:

- Generic resource type on scene detection

  This automated detection applies to participants that are an event resource type that has auto-configuration enabled. The system will keep track of all event resources of that type that fall within a configured arrived/responded radius from the traffic event location and will automatically change the participant from a resource type to the closest specific resource of that type that has been on the scene for the required amount of time. The time requirement is configurable and is meant to keep the system from performing this action if a vehicle is driving by the scene. Once a participant that was a resource type is changed to be a specific resource, the remaining two detections will apply.

- Arrived/Responded detection

  This automated detection applies only to participants that are event resources with AVL support, and does not apply if the user has manually set the arrived/responded or departed flags for the participant. The system will detect when the location of the event resource is within a configurable radius of the traffic event, and when this occurs, the system will automatically mark the participant's arrived/responded flag to true and set the associated time stamp.

- Departure detection

  This automated detection applies only to participants that are event resources with AVL support, and does not apply if the user has manually set the arrived/responded

or departed flags for the participant. Additionally, this detection only applies if the participant's arrived/responded flag is set to true. The system will detect when the location of the event resource falls outside a configurable radius of the traffic event, and when this occurs, the system will automatically mark the participant's departed flag to true and set the associated time stamp.

Note that with the Arrived/Responded and Departure detection, there is no requirement that the event resource be on the scene for a specific amount of time, or away from the scene a specific amount of time. It is assumed that since the resource is specifically assigned to the traffic event, if it is detected to be on the scene of the event it is not just passing by the incident, and once it is detected to have left the scene it is not coming back. If these assumptions are ever wrong, the user has the ability to override the Arrived/Responded and Departed flags.

In addition to obtaining location data from the AVL Service, the AVLDataManager will also periodically poll the AVL service for inventory data. The AVLDataManager will keep track of a list of known vehicles in the AVL system so that it may detect additions, deletions, and changes to AVL vehicles and notify the EventResourceManager of these changes (via its AVLDataListener interface). The EventResourceManager uses these notifications to support the auto-configure feature that can automatically add event resources to CHART based on the AVL vehicle type and configuration information in event resource types. Additionally, when an automatically configured event resource is found to no longer exist as part of the AVL inventory, CHART can automatically remove the event resource. The automatic removal of event resources can encounter the case where an event resource is in use in a traffic event at the time its removal from the AVL system is detected. CHART will handle this by allowing event resources (and types) to be marked for deletion without actually deleting them. A periodic timer will be used to detect when event resources and types are no longer in use and take them offline at that time. When taken offline, event resources and types are removed from memory and marked as offline in the database. An archival process will remove any event resources that are marked offline after it has removed all traffic events that have been marked as offline.

3.2 Traffic Signal Integration

Following are the key design decisions related to the traffic signal integration enhancements for R11:

- Zero or more Traffic Signal devices can be associated with an Action Event. Note: In most cases only one Traffic Signal device will be associated to an Action Event.
- Traffic Signals devices that are currently associated with an Action Event will be displayed on a separate map layer visible on any zoom level of the home page and event creation maps.
- Traffic Signals not currently associate with an Action Event will be displayed on a separate map layer visible only on the lowest 2 zoom levels of the home page and event creation maps.
- Traffic signals displayed on the event creation map can be used to populate the location fields on the event creation page.
- A user can associate a User Defined Signal to an Action Event. This feature is used when the traffic signal data available to CHART does not include a signal that a user wants to

add to an Action Event. The user will specify a description for the signal when associating. User Defined Signals are only listed for the Action Event they were specified for. They are not displayed on the CHART map nor the Intranet Map and are not available to be associated with any other event. They also do not display on the Intranet Map.

- Traffic Signals associated with active traffic events will be exported – primarily so the Intranet Map can display them.
- CHART GUI will periodically discovery traffic signals from a CHART web service (similar to the CHART Weather web service).
- Because of the number of traffic signals (approx. 7000), only enough information to support map requirements will be cached in the GUI. Detailed location information for a traffic signal will be requested from the web service only when needed.
- Also, Because of the number of traffic signals, objects representing signals will be cached in a separate traffic signal manager object instead of the data model (similar to how roadway links are cached).

3.3 Decision Support

Enhancements for the Decision Support feature will be added to the Traffic Event service. Suggestions can be generated for HAR messages using configurable HAR message templates. In addition to suggesting devices (and accompanying messages for DMSs and HARs) that should be added to the response plan, the system will suggest items to remove from the response plan. The suggested items to remove will be determined in the Traffic Event service (similar to the way the suggested devices are determined). Both suggestions for adding and removing can be viewed and applied in the same action in the GUI.

The web service request to get nearest exit and proximity information for possible device suggestions will be revised to allow only one request to be made that takes into account all device types (DMSs, HARs, and cameras). This will reduce the time it takes to generate suggestions and display them to a user. The message template classes will be refactored to allow key classes to be shared by both the DMS and HAR message template classes.

3.4 Send Notification Enhancements

The Send Notification Enhancements do not change the CHART design; all enhancements are being made within the context of the existing GUI design. Following are the key design concepts for this feature:

- The requirement to no longer show “10” code short cuts on the Send Notification form will be met by simply disabling this feature via its existing setting in the system profile.
- The requirement to no longer show a participants short cut on the Send Notification form (and to no longer include participants in the suggested messages) will be implemented by adding an option to enable/disable this feature in the system profile, with the default setting being disabled.
- Facility short cuts will be added to the system profile in the same manner as the existing “10” codes, including the ability to enable/disable this feature.

- When creating a lane closures description via a short cut or within a suggested notification message, the system will no longer consider shoulders or medians.

3.5 Error Processing

In general, CHART traps conditions at both the GUI and at the server. User errors that are trapped by the GUI are reported immediately back to the user. The GUI will also report communications problems with the server back to the user. The server may also trap user errors and those messages will be written to a server log file and returned back to the GUI for display to the user. Additionally, server errors due to network errors or internal server problems will be written to log files and returned back to the GUI.

3.6 Packaging

3.6.1 CHART

This software design is broken into packages of related classes. The table below shows each package that is new or changed to support the Release 11 features.

Package Name	Package Description
CHART2.Common	This package is changed to include new IDL definitions.
CHART2.DecisionSupportSvcUtil	This package is changed to support suggesting HARs and to change the framework for suggesting devices.
CHART2.DecisionSupportSvcUtil.dms	New package to support suggesting DMS messages.
CHART2.DecisionSupportSvcUtil.har	New package to support suggesting HAR messages.
CHART2.DeviceUtility.Templates	New package to support DMS and HAR message templates.
CHART2.DeviceUtility.Templates.DecisionSupport	New package to support DMS and HAR decision support message templates.
CHART2.DMSUtility.Templates	This packaged is changed to use the new template classes in the device utility package.
CHART2.DMSUtility.Templates.DecisionSupport	This packaged is changed to use the new template classes in the device utility package.
CHART2.DMSUtility.Templates.TravelerInfo	This packaged is changed to use the new template classes in the device utility package.
CHART2HARUtility	New package to support HAR decision support templates.
CHART2HARUtility.Templates	New package to support HAR decision support templates.
CHART2HARUtility.Templates.DecisionSupport	New package to support HAR decision support templates.
CHART2.LaneConfigUtil.Model	This package is changed for the enhancements to the lane closure descriptions that can be included in notifications sent from traffic events.
CHART2.MessageTemplateModule	This package is changed to support HAR message templates.
CHART2.ResourceManagement	This package is changed for new IDL definitions for event resources and types.

Package Name	Package Description
CHART2.ResourcesModule	This package is changed to remove existing functionality related to "system participants".
CHART2.TrafficEventManagement	This package is changed due to new IDL related to the participants/AVL AVL and Traffic Signal Integration features. Also, the valuetype implementation that existed previously for participants has been removed.
CHART2.TrafficEventModule	This package is changed to add support for event resources and types and changes related to participants and traffic signal integration.
CHART2.TrafficEventModule.avl	This is a new package that contains CHARTs interface to the AVL system.
CHART2.TrafficEventModule.eventresources	This is a new package that contains support for managing event resources and types.
CHART2.Utility.ObjectCache.templates	This package is changed to support caching HAR message templates.
CHART2.webservices.signalmodule	This is a new package that supports the new traffic signal web service used by the CHART GUI.
chartlite.data	Changes to support new System Profile settings.
chartlite.data.avl	New package to support AVL-related data classes.
chartlite.data.decisionsupport	This package is changed to support HAR suggestions.
chartlite.data.dms	This package is changed to support suggesting a DMS be removed from the traffic event response plan.
chartlite.data.eventresources	New package to support event resource / type data classes, discovery, and event handling.
chartlite.data.har	This package is changed to support suggesting a HAR be removed from the traffic event response plan.
chartlite.data.templates	This package is changed to support HAR message templates.
chartlite.data.trafficevents	Wrapper object changes for event resource/type participation in traffic events. . Wrapper objects added and changed to support associating traffic signals to traffic events.
chartlite.data.video	This package is changed to support suggesting a camera be removed from the traffic event response plan.
chartlite.servlet	Misc changes for R11
chartlite.servlet.dms	This package is changed to support suggesting a DMS be removed from the traffic event response plan.
chartlite.servlet.dynlist	Changes to support an Operations Center filter.
chartlite.servlet.eventresources	New package to support requests related to configuration, status, display, and selection of event resources and types.
chartlite.servlet.har	This package is changed to support suggesting a HAR be removed from the traffic event response plan.
chartlite.servlet.notification	Changes for requests related to displaying and submitting the send notification form.
chartlite.servlet.templates	This package is changed to support managing HAR message templates.
chartlite.servlet.trafficevents	Changes for requests related to resource participation in traffic events and traffic signal integration. Changes to support suggesting items be removed from the response plan of a traffic event.
chartlite.servlet.usermgmt	Changes for System Profile settings requests.

Package Name	Package Description
chartlite.servlet.video	This package is changed to support suggesting a camera be removed from the traffic event response plan.
flex/src/components	Changes to modify event launcher component for specifying field unit when creating a traffic event. Changes for showing filtered and unfiltered list of location aliases.
flex/src/data/eventresources	New package to support event resource home page data.
flex/src/homepage/model	Changes for getting home page event resource data.
flex/src/homepage	Changes for home page event resources view.

3.7 Assumptions and Constraints

3.7.1 Participants / AVL

1. The AVL System can support CHART as an additional client.
2. The CHART system's auto-detection features depend on the accuracy and timeliness of the data received from the AVL system.
3. The CHART system assumes the AVL vehicle types are well defined and are encoded at the beginning of the driver ID.

3.7.2 Traffic Signal Integration

1. Associating large numbers of traffic signals to Action Events (e.g. power outage on Eastern Shore) may cause cluttered map at higher zoom levels and performance issues
2. Because of the numbers of traffic signals, signal layers should only be enabled when needed

3.7.3 Decision Support

1. Message suggestions are dependent on the GIS web service returning valid proximity and exit information.
2. Currently, the GIS web service cannot return upstream/downstream determination for anything but devices on the same route as the traffic event; therefore, we cannot determine if a device on another route is upstream/downstream.

3.7.4 Send Notification Enhancements

There are no assumptions or contraints related to the Send Notification Enhancements feature.

4 Human Machine Interface

4.1 Participants/AVL Feature

This section describes the features of R11 related to the Event Participants/AVL Feature. Event Resource Management features have been added to allow an administrator to configure the event resource types and event resources defined in the system. Operations Center Management functionality related to defining resources available for use as traffic event participants has been enhanced. The participants section of the traffic event details page has been enhanced in addition to all participant management features on that page. New capabilities related to participants have been added. Several enhancements have been made to the existing Home Page, including a new tab to allow users to view event resources and manage their in-service / out of service status. Enhancements have been made to the open and open/closed event lists, as well as the list of traffic events that appears on the operations center report to allow the user to view the participants assigned to each event and perform management of participants.

The sections below provide details on all of the changes.

4.1.1 Event Resource Management

An administrator with the Manage Event Resources right will have access to a link on the home page to allow them to access the pages used to manage event resources and types:

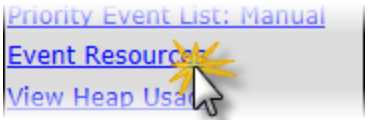


Figure 4-1 Event Resources Link in Menu

When the administrator clicks this link, they will be shown the event resources page. See the section below for details.

4.1.1.1 View Event Resources

The System Event Resource page, shown below, is used to view and manage event resources that have been defined in the system, and to add new event resources as needed. This page also provides access to the System Event Resource Types page, which is discussed in section 4.1.1.2 below.

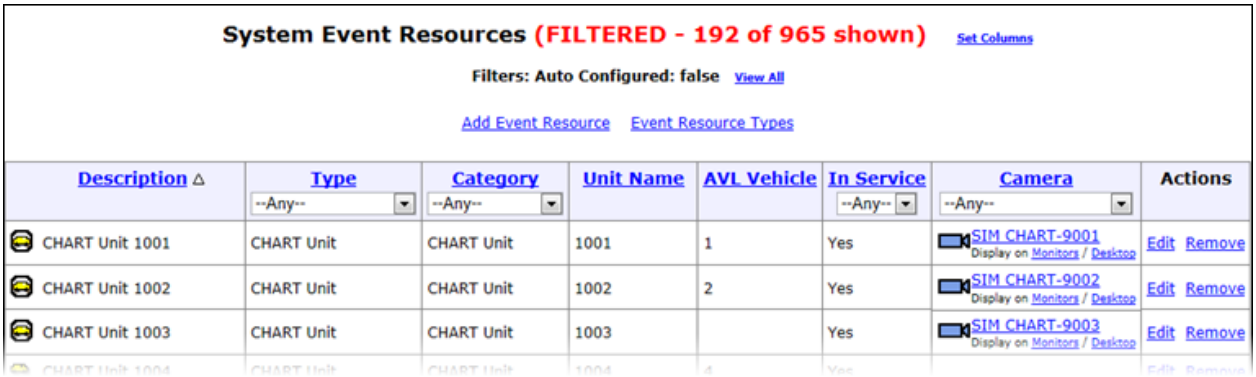


Figure 4-2 Event Resources List

The event resource list has features similar to other dynamic lists that exist in the CHART system. The list can be sorted and filtered, and the columns that are shown can be customized. The list is initially filtered to hide all "auto configured" resources, which are unnamed resources that have been added to the system automatically based on data retrieved from the AVL system. See section **Error! Reference source not found.** for more information on automatic resource configuration.

The following columns of data are available for each event resource:

Column Name	Description	Sortable	Filterable
Description	This column provides a description of the event resource, which is typically the name of the event resource type followed by the unit name. If the resource doesn't have a unit name but does have an associated AVL vehicle, that vehicle's driver ID will appear in the description. This column will also include an icon to represent the event resource type and status if the event resource type is so configured.	Yes	No
Type	This column shows the name of the event resource type that is specified for the event resource.	Yes	Yes
Category	This column shows the category of the event resource type that is specified for the event resource.	Yes	Yes
Unit Name Support	This column shows whether unit name applies to the event resource. This column can show "none" to indicate unit name does not apply, "optional: to indicate unit name is supported (but not required), or "required".	Yes	Yes
Unit Name	The unit name assigned to the event resource, if any.	Yes	No
AVL Support	This column shows whether the event resource supports having an associated AVL vehicle. This column can show "none" to indicate AVL vehicle association does not apply, "optional" to indicate AVL vehicle association is supported (but not required), or "required".	Yes	Yes

AVL Vehicle	The vehicle ID of the AVL vehicle associated to the event resource, if any.	Yes	No
In Service Support	This column shows whether the event resource supports an in service / out of service status. A value of "Yes" indicates the resource supports having its in service / out of service status set.	Yes	Yes
In Service	This column shows whether the event resource is currently marked as being in service. The value will be "Yes" or "No" if the event resource In Service Support is Yes, and will be empty if In Service Support is "No".	Yes	Yes
Camera Support	This column shows whether the event resource supports having an associated camera. A value of "Yes" indicates the resource does allow a camera to be associated.	Yes	Yes
Camera	This column shows the camera associated with the event resource, if any. The name of the camera is a link to the details page for that camera. A link also exists to launch the form used to display the camera on a monitor if the user has rights to display cameras. Additionally, if the camera can be displayed on the user's desktop, a link appears to launch the desktop video for the camera.	Yes	Yes
Actions	The actions column contains links for actions that can be performed on the event resource. The Edit link allows the configuration data for the event resource to be viewed and edited. The Remove link allows the event resource to be removed (or marked for removal when it is no longer in use as a traffic event participant).	No	No

4.1.1.2 View Event Resource Types

The System Event Resource Types page is accessed via a link on the System Event Resources page:

Figure 4-3 Event Resource Types link

The System Event Resource Types page shows all event resource types that have been defined and allows an administrator with the Manage Event Resources right to view and configure existing event resource types and to add new ones. The event resource type list has features similar to other dynamic lists that exist in the CHART system. The list can be sorted and filtered, and the columns that are shown can be customized.

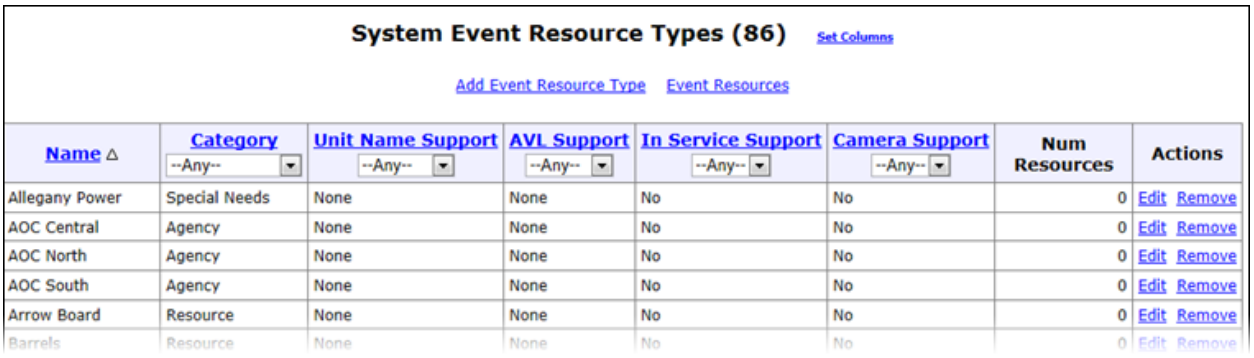


Figure 4-4 Event Resource Types List

The following columns of information are available in this list:

Column Name	Description	Sortable	Filterable
Name	The name of the event resource type.	Yes	No
Category	The category of the event resource type.	Yes	Yes
Unit Name Support	Indicates the level of support for unit names (none, allowed, required) to be used as the default when event resources of this type are added. (Can be overridden per event resource when they are added / edited.)	Yes	Yes
AVL Support	Indicates the level of support for AVL vehicle association (none, allowed, required) to be used as the default when event resources of this type are added. (Can be overridden per event resource when they are added / edited.)	Yes	Yes
In Service Support	Indicates if event resources of this type support in service / out of service status by default. (Can be overridden per event resource when they are added / edited.)	Yes	Yes
Camera Support	Indicates if event resources of this type support association of a camera by default. (Can be overridden per event resource when they are added / edited.)	Yes	Yes
Num Resources	Shows the number of event resources of this type that exist in the system.	No	No
Actions	Provides links for actions that can be performed on an event resource type. The Edit link allows the configuration of the event resource type to be edited. The Remove link, which only appears if there are no event resources of this type in the system, allows the event resource type to be removed (or marked for removal	No	No

	when it is no longer in use as a traffic event participant).		

4.1.1.3 Add Event Resource Type

This form allows an event resource type to be added to the system. This same form is used when editing an existing event resource type, except the fields will be populated with the

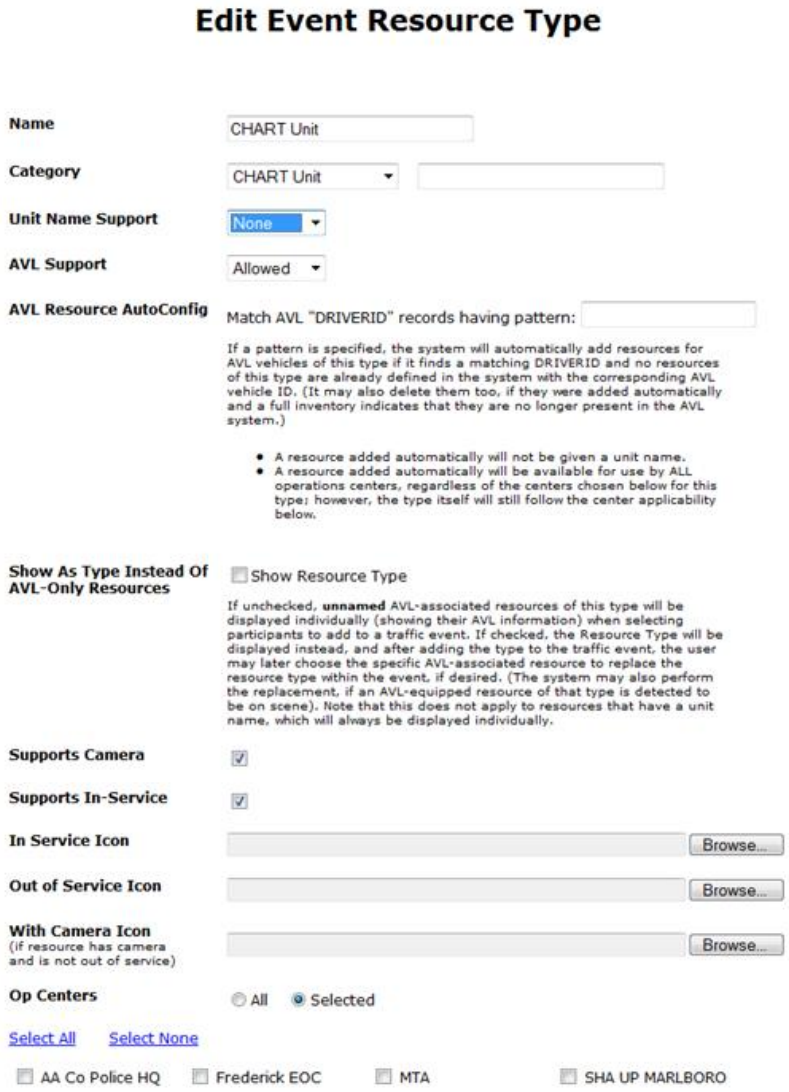


Figure 4-5 Add / Edit Event Resource Type Form

The following fields may exist on this form, depending on the current selections:

Field Name	Description	Required
Name	Name of the event resource type.	Yes
Category	The category of the event resource type. The user can select from a list or enter a new value (which will then become available in the list the next time the form is	Yes

	used).	
Unit Name Support	The level of unit name support for resources of this type by default (none, allowed, required).	Yes
AVL Support	The level of support for AVL vehicle association for resources of this type by default (none, allowed, required).	Yes
AVL Resource Auto Config	This field is shown if AVL support is not set to "None" and when Unit Name Support is not set to "Required". When present, this field allows the administrator to enter one or more characters that are used to identify AVL vehicles of this type. When the system finds AVL vehicles whose Driver ID begins with the characters entered here, the system will automatically add them as event resources of this type, without a name but with an associated AVL vehicle. Vehicles added to the system in this manner are called "auto configured event resources". The system will also automatically remove event resources that are added in this manner when they are detected to no longer be present in the AVL system.	No
Show As Type Instead of AVL-Only Resources	This flag, when checked, indicates that if there are any unnamed event resources with an associated AVL device (such as auto configured event resources), that those unnamed resources should not appear in the list used to add event resources and types as participants in a traffic event, and instead only the type should be shown. As an example, if there is a type named Dump Truck and 800 individual dump trucks that have been configured automatically, if this box is checked, the 800 dump trucks will not be in the pick list	No
Supports Camera	This flag indicates if resources of this type support having an associated camera, by default.	No
Supports In Service	This flag indicates if resources of this type support having an in service / out of service status by default.	No
In Service Icon	This field is required if the resource type supports in service. It allows an icon image to be uploaded to be used to represent resources of this type when the resource is in service (and doesn't have an associated camera).	Only when Supports In Service is checked
Out of Service / General Icon	This field is required if the resource type supports in service, and is allowed otherwise. It allows an icon image to be uploaded to be used to represent resources of this type that are out of service, or to be used as the general icon for the type for resources that don't support	Only when Supports In Service is checked

	the in service / out of service status	
With Camera Icon	This field is required if the resource type supports in service and supports camera association. It allows an icon to be uploaded to be used when the resource has a camera associated and the resource is in service.	Only when Supports In Service is checked and Supports Camera is checked
Op Centers	This area of the form allows the user to specify that the resource type should be available for use as an event participant for all operations centers (existing and future), or for specific operations centers. Note that if there will be named resources of this type, you usually would not the type itself to appear as a participant in a traffic event; you would want the user to pick one of the specific event resources instead.	No

4.1.1.4 **Edit Event Resource Type**

An event resource type can be edited using the Edit link for the event resource type in the event resource type list. Editing is very similar to adding an event resource type, with the difference being the add form (shown in the section above) will be pre-populated with the existing values from the event resource type being edited.

4.1.1.5 **Remove Event Resource Type**

An event resource type can be removed from the system (or marked for removal if it is currently in use in a traffic event) using the Remove link for the event resource type in the event resource type list. The remove link will not be available if any event resources in the system of this type exist in the system. If the event resource type is currently in use as a traffic event participant, it will be marked for removal and will no longer appear in the event resource type list. The system will remove it from the system when all traffic events that were using the event resource type have been removed from the system (taken offline).

4.1.1.6 **Add Event Resource**

This form is used to add a new event resource to the system (or to edit an existing event resource).

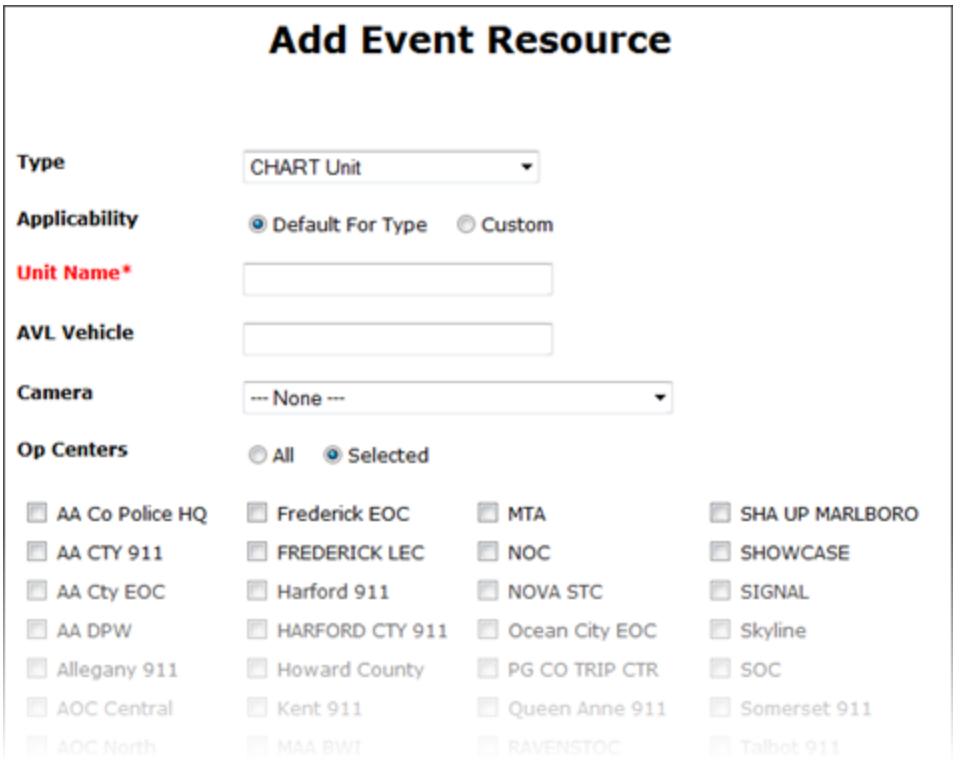


Figure 4-6 Add / Edit Event Resource Form

The following fields are available, depending on selections made on the form:

Field Name	Description	Required
Type	The type of the event resource.	Yes
Applicability	When set to Default For Type, the fields that are applicable for the event resource will be the same as those in the selected type. When set to Custom, fields will appear to override the settings in the type and customize the settings for this particular event resource. (Note that, if a resource is added and the type's settings are changed afterward, the resource will have "custom" settings as they were copied from the type).	Yes
Unit Name Support	This field is only shown when Applicability is set to Custom, and is required when it is visible. It indicates if the unit name for this event resource applies, and if it applies whether or not it is required or optional.	Yes, when visible
AVL Support	This field is only shown when Applicability is set to Custom, and is required when it is visible. It	Yes, when visible

	indicates if the AVL vehicle association applies for this event resource, and if it applies whether or not it is required or optional.	
Supports Camera Association	This field is only shown when Applicability is set to Custom. It indicates if the event resource can have an associated camera.	No
Supports In Service	This field is only shown when Applicability is set to Custom. It indicates if the event resource supports in service / out of service status.	No
Unit Name	This field is visible if Applicability is set to Default for Type and the type's Unit Name Support is set to Allowed or Required, or Applicability is set to Custom and Unit Name Support is set to Allowed or Required. It specifies the name of the event resource.	Yes, if applicability settings specify Required
AVL Vehicle	This field is visible if Applicability is set to Default for Type and the type's AVL Support is set to Allowed or Required, or Applicability is set to Custom and AVL Support is set to Allowed or Required. It specifies the vehicle ID of the AVL unit associated with the event resource.	Yes, if applicability settings specify Required
Camera	This field is visible if Applicability is set to Default for Type and the type's Camera Support is set to true (checked), or Applicability is set to Custom and Camera Support is set to true (checked). It specifies the camera associated with the event resource.	No
Op Centers	This area of the form allows the user to specify that the event resource should be available for use as an event participant for all operations centers (existing and future), or for specific operations centers. It is usually the case that an event resource should be associated with one or more op centers unless it is an unnamed resource.	No

4.1.1.7 **Edit Event Resource**

An event resource can be edited using the Edit link for the event resource in the event resource list. Editing is very similar to adding an event resource, with the difference being the add form (shown in the section above) will be pre-populated with the existing values from the event resource being edited.

4.1.1.8 Remove Event Resource

An event resource can be removed from the system (or marked for removal if it is currently in use in a traffic event) using the Remove link for the event resource in the event resource list. If the event resource is currently in use as a traffic event participant, it will be marked for removal and will no longer appear in the event resource list. The system will remove it from the system when all traffic events that were using the event resource have been removed from the system (taken offline).

4.1.2 Operations Center Management

The existing web page used to configure settings for an operations center is changed for R11 to replace existing functionality that was used to set eligible traffic event participants for use by users of the operations center (or traffic events created by the center) when managing events. The new functionality makes use of the new event resources and types and provides a more streamlined approach to setting the event resources and types that should be available as participants in traffic events. See the sections below for more details.

4.1.2.1 View Event Resources and Types for Center

The operations center details page has a new section named "Event Resources" that replaces the "Eligible Participants" section that existed prior to R11:

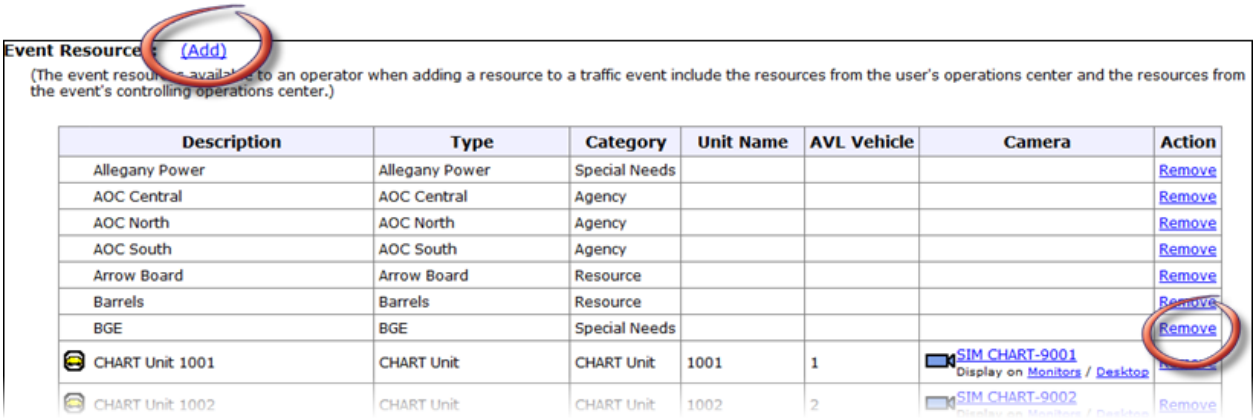


Figure 4-7 Event Resources and Types Assigned to Center

The event resources and types that have been associated with the operations center are shown in a list. The following information is shown for each event resource or type:

Column Name	Description
Description	This column contains a description of the event resource or type. If the item is an event resource, an icon is used to indicate its type, and whether or not the event resource is currently in service, or in service with an associated camera.
Type	The type of the event resource or the name of the event resource type.
Category	The category of the event resource type assigned to the event resource (or the catetgory of the event resource type)

Unit Name	The unit name, if the item is an event resource and it has a unit name.
AVL Vehicle	The ID of the AVL vehicle assigned to the event resource, if the item is an event resource and has an associated AVL vehicle.
Camera	The camera associated to the event resource, if the item is an event resource and has an associated camera. The name of the camera is a link to the camera details page for the camera. Links also exist to allow you to display the camera on a monitor or the desktop, if applicable.
Action	This column contains a Remove link to allow you to remove an event resource or type so it is no longer associated with the operations center. Note that if an event resource is set to apply to all centers, it cannot be removed from individual centers. You must first edit the event resource so it is no longer associated with all centers, then you can set which individual centers it applies to.

4.1.2.2 **Add Event Resources and Types for Center**

A user with the Configure System right can add event resources and types to an operations center to be made available as event participants for the op center's users.

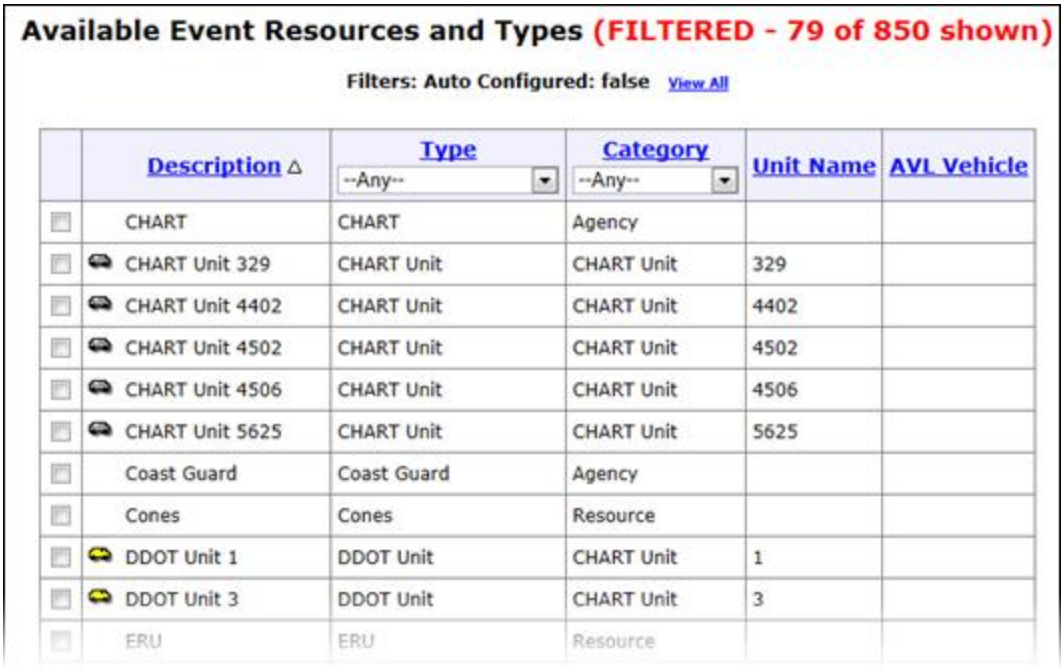


Figure 4-8 Associate Event Resources and Types to Center

The form shows all event resources and types in the system that are not yet associated with the op center, and initially filtered to hide auto configured event resources. The form allows the resources and types to be sorted and filtered, and allows the user to check a box for any resource or type they wish to add to the op center. Users selections are maintained even if they sort or filter the list such that a selected item isn't visible under the current filter.

The following data is shown for each item in the list:

Column Name	Description
	The first column contains a checkbox that allows the user to indicate an item is to be added to the op center.
Description	This column contains a description of the event resource or type. If the item is an event resource, an icon is used to indicate its type, and whether or not the event resource is currently in service, or in service with an associated camera.
Type	The type of the event resource or the name of the event resource type.
Category	The category of the event resource type assigned to the event resource (or the catetgory of the event resource type)
Unit Name	The unit name, if the item is an event resource and it has a unit name.
AVL Vehicle	The ID of the AVL vehicle assigned to the event resource, if the item is an event resource and has an associated AVL vehicle.

Options are provided at the bottom of the form to make selections of multiple items easier:

Figure 4-9 Selection Options for Event Resources and Types

The Select Visible button will place a check mark in all items currently visible on the form. It does not affect items that are not shown due to filters. Clear Visible Selections unchecks all items currently visible on the form, and does not affect items not currently shown due to filtering. Clear All clears the checkbox for all items, even those not currently shown due to filtering.

After the user makes selections on this form, the Submit button is used to associate the selected items with the operations center. Cancel can be used to close the form without making any changes to the list of event resources and types associated with the op center.

4.1.2.3 Remove Event Resources and Types from Center

If the user has the Configure System right, the list of event resources and types associated with the center will have a Remove link for each item in the list. This link removes the associated item from the op center after user confirmation.

4.1.3 Traffic Event Details

The participants section of the traffic event details page is modified for R11 to provide support for the new event resources and event resource types. Additional features that take advantage of AVL data are also added. See the sections below for more details.

4.1.3.1 View Participants

The Participants section of the traffic event details page is enhanced to show more information about participants assigned to the traffic event, which can now be event resources or event resource types.

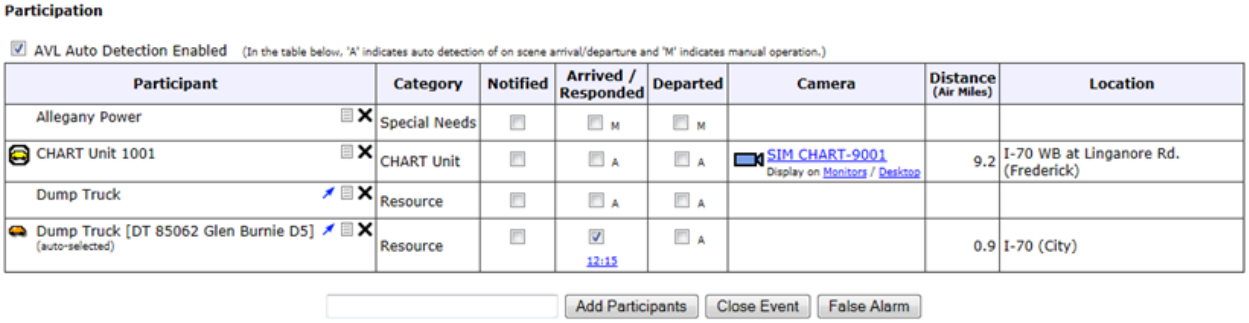


Figure 4-10 Participation Section of Event Details

A checkbox at the top of the section indicates if the AVL auto detection feature is enabled. A user with the Manage Traffic Event right can toggle this checkbox to enable and disable the auto-detection feature, described below. This checkbox will not appear if AVL auto detection has been disabled system-wide in the system profile. For each participant, the following columns of data are shown:

Column Name	Description
Participant	A description of the participant. Participants can be event resources or event resource types. If the participant is an event resource, the description will be the name of the type and the unit name (if any). If the event resource doesn't have a unit name but does have an associated AVL vehicle, the vehicle's driver ID will be included in the description. Event resources will also show an icon that indicates the type of the resource, and if that resource supports in service / out of service status, the icon will indicate if the resource is in service or out of service. If the resource is in service, the icon will indicate if the resource has an associated camera. An indication will also appear in this column if the resource is auto selected. See section 4.1.3.6 below for more information on automatic resource selection. Lastly, a toolbar appears in this column to allow actions to be peformed on the resource. See sections 4.1.3.3, 4.1.3.4, and 4.1.3.5 below for more information on the tool bar actions.
Category	The category of the event resource type (or of the event resource type assigned to the event resource).
Notified	A checkbox that allows the user to indicate the participant has been notified. When checked, the box will show the timestamp that indicates when the participant was notified. That time is set to the current time by default, but can be changed by the user.
Arrived/Responded	A checkbox that allows the user to indicate the participant has arrived on the scene of the event or responded to the notification. An M or A will appear next to the checkbox to indicate if the checkbox is in automatic or

	manual mode. When in automatic mode, the system will attempt to check the box automatically by detecting an AVL equipped event resource is on the scene of the event. If the participant is not equipped with AVL, the participant is a type that is not auto-configured, or if the user has previously selected this checkbox (or the departed checkbox), the checkbox will indicate manual mode is active, and the box will not be automatically checked by the system. When the box becomes checked, either by the user or by the system, a timestamp will appear to indicate when the participant arrived/responded. The current time will be used by default, but the user can edit the time. Once the box is checked, the M/A indicator will no longer appear – checked boxes are always in manual mode, the system will not un-check the box.
Departed	A checkbox to allow the user to indicate if the participant has departed from the scene of the traffic event. Like the Arrived/Responded checkbox, an M or A will appear to indicate if the checkbox is in manual or automatic mode. When in automatic mode, the system will attempt to detect if the AVL equipped event resource departs the scene of the event and will check this box automatically. When in manual mode, the system will not check this box automatically and the user must check it. This will be the case if the participant is an event resource type or is an event resource that does not have an associated AVL vehicle. Manual mode will also apply if the user has clicked either the Arrived/Responded checkbox or the Departed checkbox previously. When the box becomes checked, either by the user or by the system, a timestamp will appear to indicate when the participant departed. The current time will be used by default, but the user can edit the time. Once the box is checked, the M/A indicator will no longer appear – checked boxes are always in manual mode, the system will not un-check the box.
Camera	This column shows the camera associated with an event resource participant, if any. The camera name is a link to the camera details page for the camera. Additional links appear to allow the user to display the camera on a monitor or on the desktop, if applicable.
Distance	This column applies to event resource participants with an associated AVL vehicle and shows the distance from the location of the traffic event, if the traffic event has a lat/long specified and the AVL vehicle associated with the event resource has current location data.
Location	This column applies to event resource participants with an associated AVL vehicle and shows the current location of the event resource if the AVL vehicle associated with the event resource has current location data.

4.1.3.2 **Add Participants**

A search field and button beneath the list of participants is used to add participants to the traffic event. The user can optionally type into the search field prior to clicking the Add Participants

button to pre-filter the Add Participants form, or to bypass the form completely if their search text matches exactly one event resource or type in the system.

Figure 4-11 Add Participants to Traffic Event Button

As the user types in the search field, event resources and types that match the text in the search field will be shown as suggestions and the user may choose a suggestion to add that event resource or type to the traffic event participant list immediately.

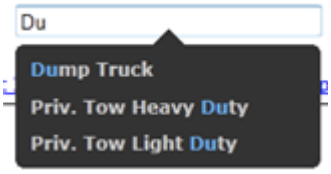


Figure 4-12 Add Participants to Traffic Event Suggestions

If the user does not choose a suggested event resource or type and clicks the Add Participants button and their search text does not match exactly one event resource or type that exists in the system (or they haven't entered search text), a form will appear to allow the user to select the participants to be added.

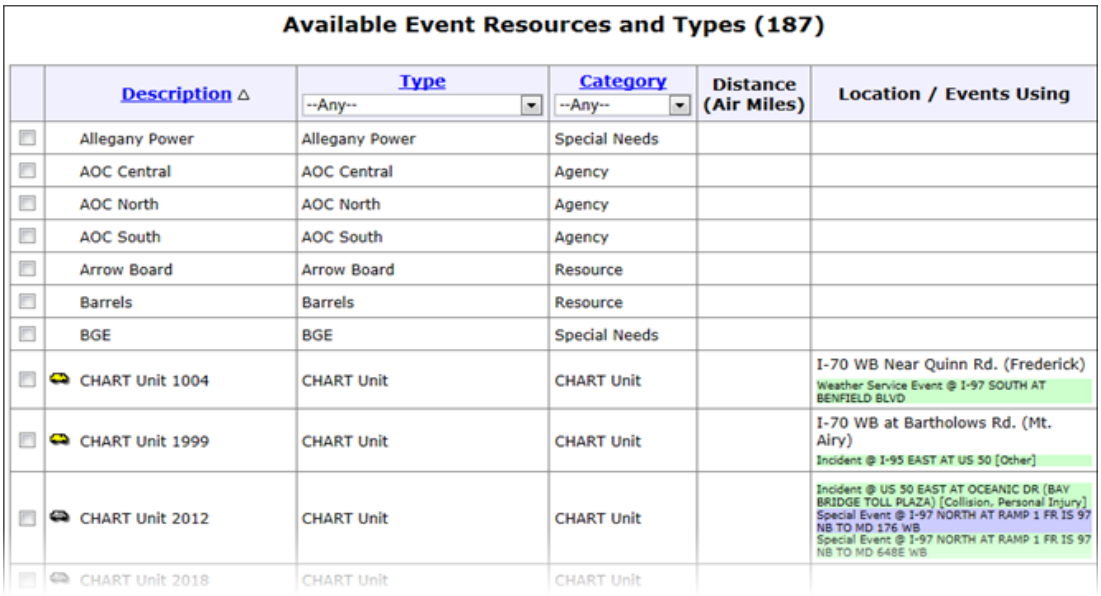


Figure 4-13 Add Traffic Event Participants Form

This form allows the user to check a box for each event resource or type they wish to add to the traffic event as a participant. The user can sort and filter this list, and the form will maintain the user's selections even if a prior selection is no longer visible due to a filter that is currently applied. The following columns of data exist on this form:

Column Name	Description
	The first column contains a checkbox that allows the user to indicate an item is to be added as a participant in the traffic event.
Description	This column contains a description of the event resource or type. If the item is an event resource, an icon is used to indicate its type, and whether or not the event resource is currently in service, or in service with an associated camera.
Type	The type of the event resource or the name of the event resource type.
Category	The category of the event resource type assigned to the event resource (or the catetgory of the event resource type)
Distance (Air Miles)	The distance of the event resource from the location of the traffic event. (Does not apply to event resource types or event resources that do not have an associated AVL vehicle with a current location.)
Location / Events Using	This dual use column shows the current location of the event resource, if the event resource is associated with an AVL vehicle with a current location, and shows the traffic events the resource or type is currently assigned to. Each traffic event name is a link to the event details page for that event. An asterisk appears for any traffic event where the event resource is marked as arrived/responded and not marked as departed.

4.1.3.3 Select Specific Resource For Type

If an event resource is an event resource type that has the auto configure feature enabled, or if a specific resource of that type has been previously selected (by the user or the system), a tool will appear to allow a specific event resource to be selected to replace the resource type in the participant record (or to replace a previously selected event resource).

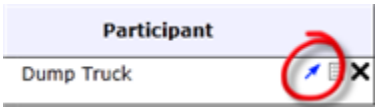


Figure 4-14 Event Resource Selection Tool

When this selection tool is clicked, a form appears to allow the user to select a specific resource of the specified type (or of the originally specified type if a specific event resource was previously selected).

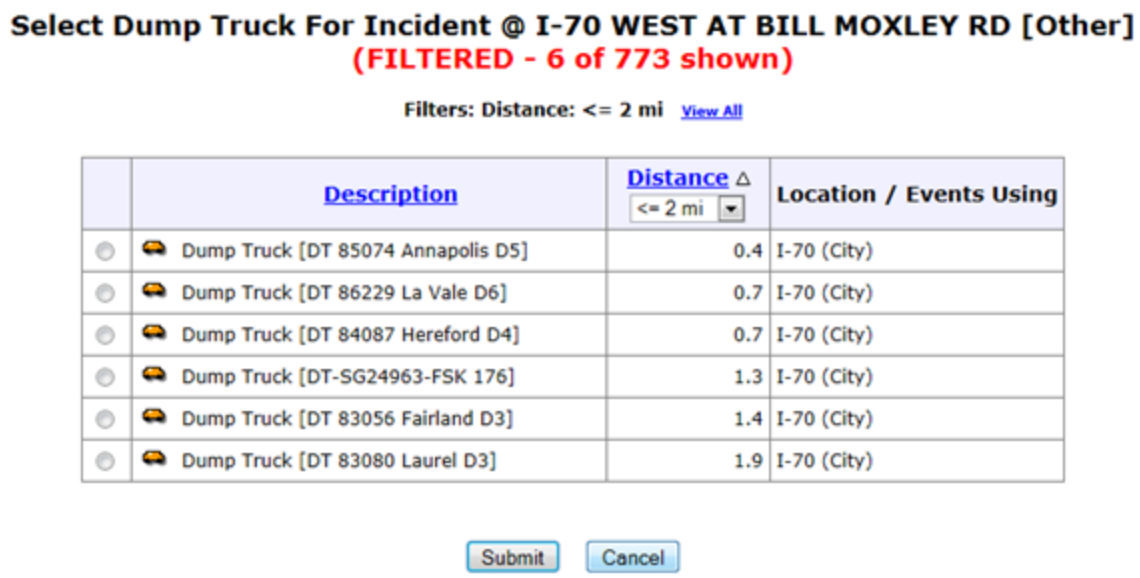


Figure 4-15 Select Specific Event Resource to Replace Generic Type

The form shows event resources of the specified type, ordered by distance from the traffic event. The description of each event resource is shown in addition to the current location. The user can sort the list by description or distance from the event, and can filter the list by distance from the event. The user can select an event resource from the list and click the Submit button to change the event resource type participant into an event resource participant.

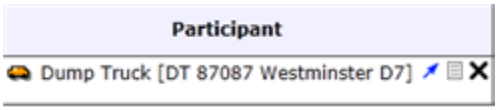


Figure 4-16 Participant with Specific Resource Replacing Generic Type

Notice the selection tool remains available after a selection has been made to allow the user to change their selection.

4.1.3.4 Add Participant Notes

The notes tool exists for every participant listed for a traffic event. This tool allows the user to enter notes about the participant to identify the driver (by call sign and/or name) or to enter general notes about the participant.

Figure 4-17 Add Participant Notes Tool

When the user clicks the note tool, a form appears to allow them to make their note entries.

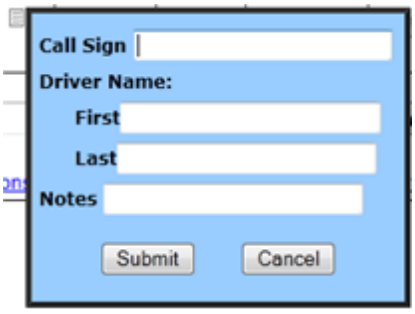


Figure 4-18 Add Participant Notes Form

After making their entries, the user can click submit, and the notes they entered will appear beneath the participant in the participant list.

Figure 4-19 Participant Notes on Event Details Page

If previous notes were entered the form will contain the previous values and the form can be used to edit those values.

4.1.3.5 Remove Participant

The removal tool exists for each participant listed for a traffic event. This tool is used to remove a participant from the traffic event.

Figure 4-20 Remove Participant Tool

If the user clicks the removal tool, the participant will be removed from the traffic event after the user confirms their action.

4.1.3.6 Automatic Resource Selection

If an event resource type is added as a participant in the traffic event and that event resource type supports auto configuration, the system may automatically attempt to replace the event resource type with a specific event resource of that type based on AVL data. This will not be attempted if AVL auto detection has been disabled system wide or for the traffic event, or if the user has entered any notes for the participant. If the feature is enabled, the system will attempt to detect when an unnamed event resource with an associated AVL vehicle arrives within the arrived/responded radius of the traffic event, and remains within that radius for a configured amount of time. When that occurs, the sytem will automatically replace the event resource type with that specific event resource. (In the event 2 or more event resources meet the detection criteria, the one closest to the event will be chosen.) After a specific resource is automatically selected by the system, an indication will appear beneath the participant to indicate it was automatically selected (see below).

4.1.3.7 Automatic Arrival / Departure Detection

If a participant is an event resource that has an associated AVL vehicle and auto AVL detection is enabled system wide and for the traffic event, and the arrived/responded checkbox is in automatic mode, the system can automatically detect when that resource arrives on the scene of the traffic event. When the system detects the event resource is within a configured radius of the traffic event, it will automatically mark the participant as arrived/responded and set the arrived/responded time to the current time. Similarly, if the departed checkbox is in auto mode and the participant is marked as arrived/responded, the system will detect when the event resource leaves a configurable radius around the event location. When this is detected, the system will automatically mark the participant as departed using the current time as the timestamp. Note: the radius for detecting arrival and the radius for detecting departure are two separate configuration settings.

4.1.4 Home Page

CHART R11 includes several changes to the home page. A new tab is added to the home page to allow the user to view the event resources associated with their center that support in service and out of service. Users can view the status of these resources and change their in service / out of service status. The home page map is updated to include layers to allow AVL equipped event resources to be viewed (when zoomed in). The Create Event form is updated to allow the user to select a specific field unit as the source of the event. See the sections below for details.

4.1.4.1 View Event Resources

A new tab is added to the home page to allow the user to view the event resources associated with their center that support setting the in-service and out of service status. The tab is divided into two sub-tabs, one for field units, and one for facilities. Any event resource that supports in service and AVL is considered a field unit, while those that support in service and not AVL are considered facilities.

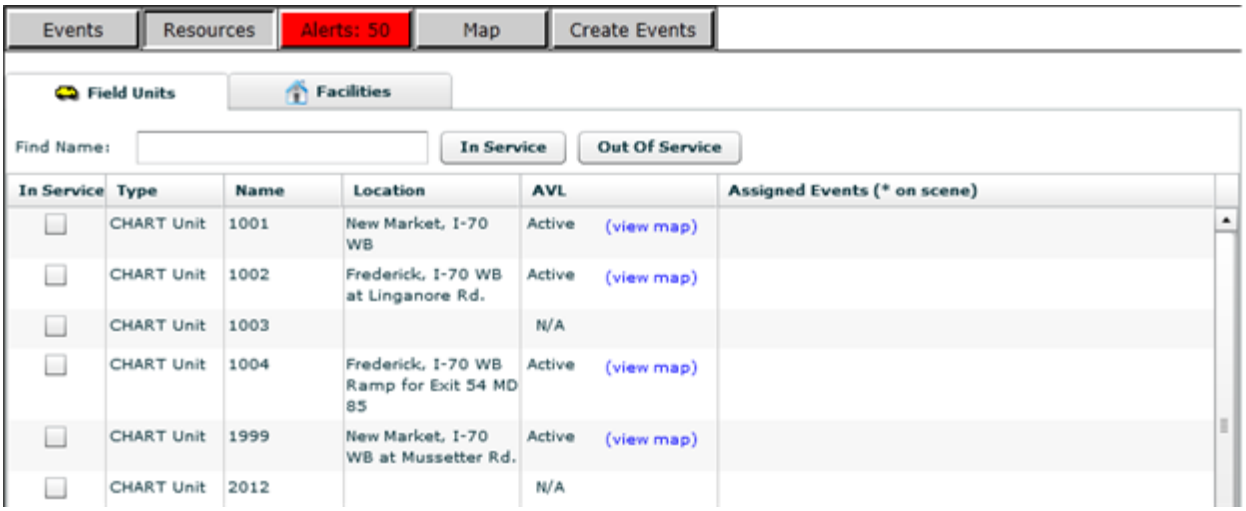


Figure 4-21 Event Resources on Home Page

The Field Units and Facilities tabs differ slightly in that the Facilities tab does not contain the Location or AVL columns (because facilities don't support AVL). Other than that, the features

of the tabs are identical. For each event resource shown on one of these tabs, the following information is shown:

Column Name	Description
In Service	This column contains a check box that indicates if the event resource is in service or out of service. A check mark in the box indicates in service. The absence of a check mark indicates out of service.
Type	The type of the event resource.
Name	The name of the event resource.
Location	The current location of the event resource, if the location data for the event resource is current. Applies only to the Field Units tab.
AVL	The current AVL status of the event resource. Indicates if AVL is active, inactive, or N/A if an AVL vehicle is not associated with the event resource. When the status is Active, a "(view map)" link appears, that when clicked will zoom the home page map to the location of the event resource. Applies only to the Field Units tab.
Assigned Events	The list of events to which the event resource is currently assigned. An asterisk appears next to any events where the event resource is marked as arrived/responded but not departed.

The Find Name field at the top of each tab allows the user to type characters and see suggestions of event resources whose names begin with the characters that were typed. The user can then either select a suggested unit, or if their entry matches a single event resource, just tab out of the field and the event resource will become selected and the list will be scrolled if needed such that the event resource is visible on the screen. The user can use the In Service or Out of Service button to set the status of the selected event resource.

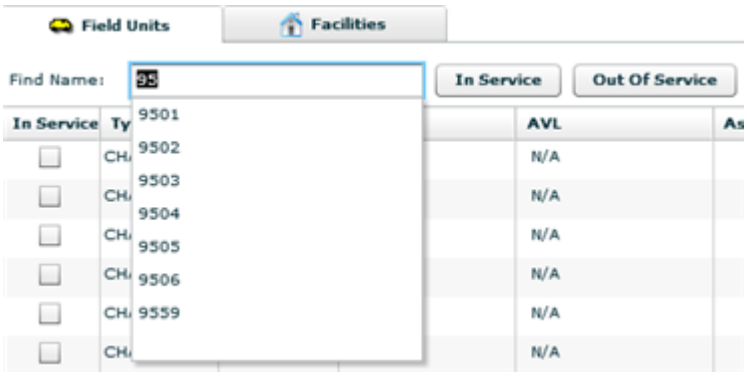


Figure 4-22 Event Resource Search on Home Page

The user may also click on a check box for an event resource to toggle its in service / out of service status.

4.1.4.2 View Event Resources on Home Page Map

A new group of layers is added to the home page map; one layer for each event resource type that has AVL equipped event resources. The layers can be controlled individually, or via the layer group named Event Resources in the existing layer control on the home page map.

Figure 4-23 Event Resources Map Layers

Event resources only appear on the map when zoomed into a very low level. The event resources appear as one of the icon images specified for the event resource type, depending on the status of the event resource (in service, out of service, or in service with camera).

Figure 4-24 Event Resource Icon Example (In Service)

Figure 4-25 Event Resource Icon Example (Out of Service)

Figure 4-26 Event Resource Icon Example (In Service with Camera)

If the user hovers their mouse over the icon of an event resource, the name of the event resource is shown. If the event resource doesn't have a name, the driver ID is shown.

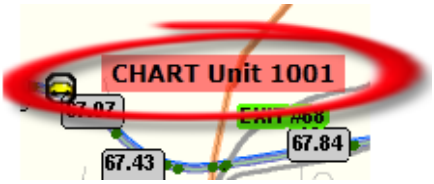


Figure 4-27 Event Resource Tool Tip

Figure 4-28 Event Resource Tool Tip (no unit name)

If the user hovers their mouse over an area with overlapping icons, a list is shown with all of the overlapping icons.

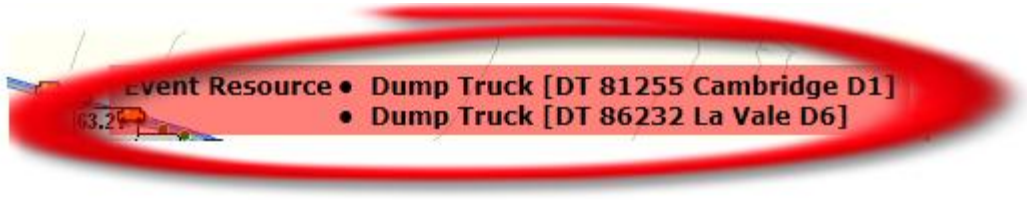


Figure 4-29 Event Resource Tool Tip (overlapping icons)

If the user clicks on an event resource icon, or selects an event resource from a list of overlapping icons, a popup for the event resource is shown.

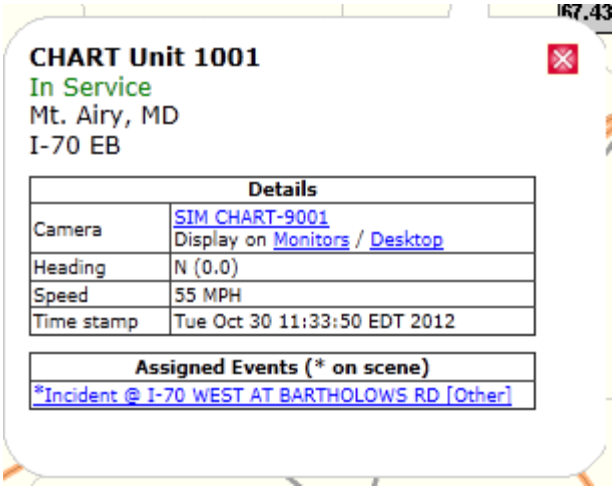


Figure 4-30 Event Resource Map Pop Up

The popup contains the following information:

Name	This will be the event resource name, or the name of the AVL Driver ID if the event reseource doesn't have a name.

In Service Status	If the event resource supports in service / out of service status, its current status will be shown.
City, State	The city and state where the event resource is located will be shown if this information is available in the AVL data.
Location	The current location where the event resource is located will be shown if this information is available in the AVL data.
Camera	If the event resource has an associated camera, its name is shown. The name is also a link, which if clicked causes the camera's details page to appear in the working window. Links are also provided to launch the form used to display the camara on a monitor or to view the camera on the desktop, if applicable.
Heading	The current heading of the event resource is shown, as obtained via the AVL data.
Speed	The current speed of the event resource is shown, as obtained via the AVL data.
Time stamp	The time stamp of the AVL data that is shown (and used to position the icon of the event resource).
Assigned Events	A list of the events to which the event resource is assigned, if any. The name of each event is a link that when clicked causes the event details page to be shown in the working window. An asterisk will appear next to any event where the event resource is marked as arrived/responded and not departed.

4.1.4.3 **Create Event Enhancement**

The create event form on the home page is enhanced to allow the user to select a specific field unit as the source of the traffic event information. The source type selection that used to read "CHART Unit" is changed to the more generic term "Field Unit". If the user selects "Field Unit" as the source type, the Source Name field field beneath the Source Type field changes to "Field Unit".

Figure 4-31 Create Event: Source Type of Field Unit

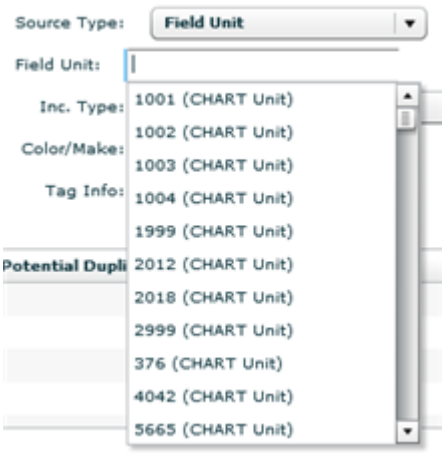


Figure 4-32 Create Event: Field Unit Selection

The Field Unit field is a select list that contains all of the field units listed on the Resources Field Units tab. As the user types, the list is automatically filtered to include only those field units whose name starts with the characters that were typed. The user can make a selection or leave a partially typed unit name. When the traffic event is created, if the user has selected a specific field unit or the text they typed matches the name of exactly one field unit, that field unit will be added to the event as a participant and its Notified flag will be set to true.

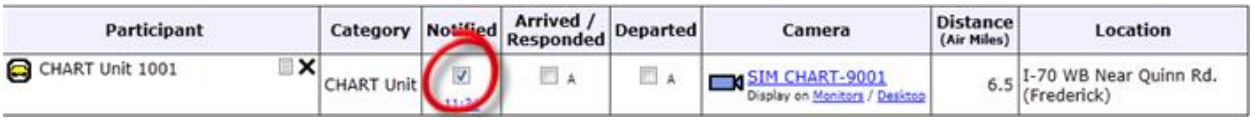


Figure 4-33 Create Event: Automatic Notified Participant Addition

4.1.5 Edit General Event Information

The Edit General Event Information form, accessible from the traffic event details page, which previously had Source and Source Description fields, will be changed to be consistent with the changes to the Create Event form as described in 4.1.4.3 above, although a participation record will not be added to the traffic event when the form is submitted.

4.1.6 View Open (or Open/Closed) Events Page Enhancements

The traffic event list that appears when the user chooses to view open events or open/closed events is enhanced to show the number of participants in the traffic event.

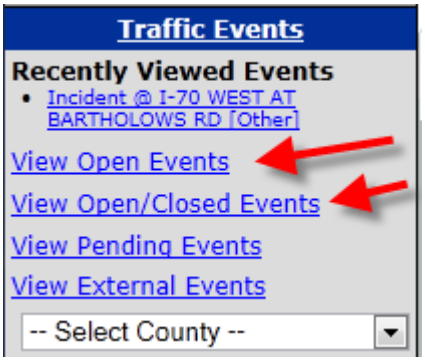


Figure 4-34 Links to view Open and Closed Events

Figure 4-35 Participants Shown in Event List

The number of participants is shown in the Op Center column (and will not appear if the Op Cener column is hidden). If the user clicks on the participants link, a pop up shows a list of the participants and their current status (notified, arrived/responded, departed).

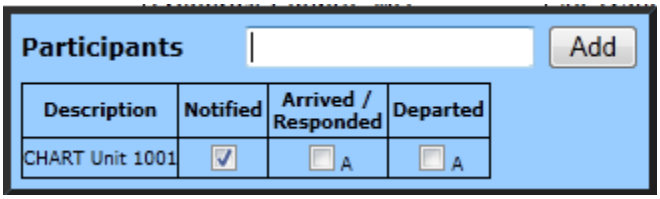


Figure 4-36 Participants Pop Up from Event List

If the user has rights to manage traffic events, they can toggle the Notified, Arrived/Responded, and Departed check boxes directly from this form. They can also launch the form used to add participants to the event, and optionally type search text prior to launching the Add form to pre-filter the list of event resources and types. See section 4.1.3.1 above for more information about viewing participants. See section 4.1.3.2 above for more information on adding participants.

4.1.7 View Op Center Report Enhancements

The op center report, which is shown in the working window when the user logs in, contains a list of open traffic events assigned to the center. This list is enhanced to show the number of traffic event participants in the same manner as described in section 4.1.6 above.

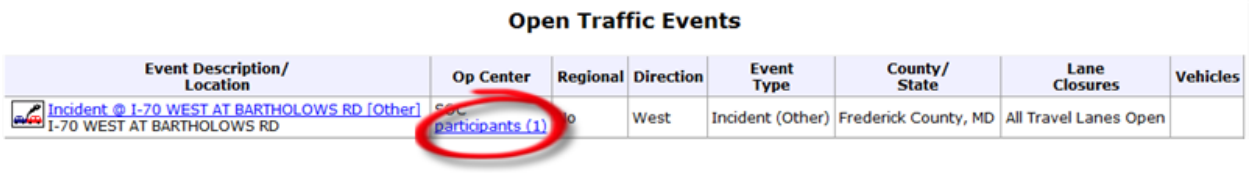


Figure 4-37 Participants Shown in Op Center Report

4.2 Traffic Signal Integration

This section describes the human-machine interface for the traffic signal integration feature for R11.

4.2.1 Home Page and Event Creation Maps

Traffic Signals devices currently existing in the Signal Shop Data (Signal Book) will be displayed as traffic signal icons on both the Home Page and Event Creation maps. Traffic signal devices that are currently associated with an Action Event will be displayed on the "Signals (Action Event)" layer on any zoom level. Traffic signal devices not currently associated with an Action Event will be displayed on the "Other Signals" layer but only at the lowest 2 zoom levels. Traffic Signal devices that are associated with an Action Event will have a red background while other signals will have a white background. Popup dialogs for traffic signal devices will include the device description, links to any associated traffic events and any AORs that currently contain the device.

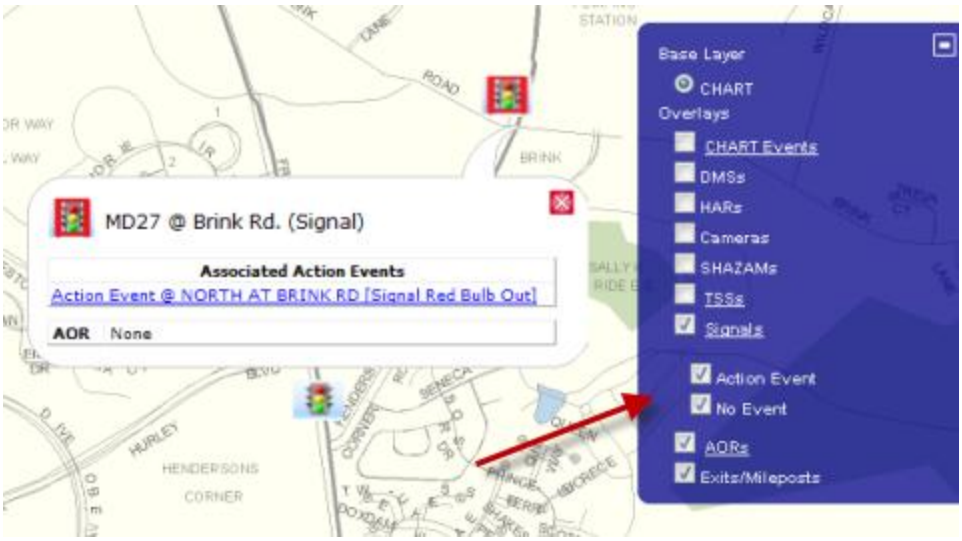


Figure 4-38 Home Page Map Signal Layers

4.2.2 Specifying Initial Event Location Using Traffic Signal

On the Event Creation map, a user can specify the event location using the location of a traffic signal device visible on the map. The traffic signal popup dialog contains an "Update Event Location" link that can be used to update the location controls on the event creation window using the specified traffic signal's location information. When a traffic signal device is used to specify the location for a traffic event, if the user creates an Action Event that traffic signal device will automatically be associated with the newly created Action Event. If the Reset Form button is pressed before the Action Event is created the traffic signal will not be associated with the Action Event on creation. Note: traffic signal devices can also be associated after creation on the Action Event details page.

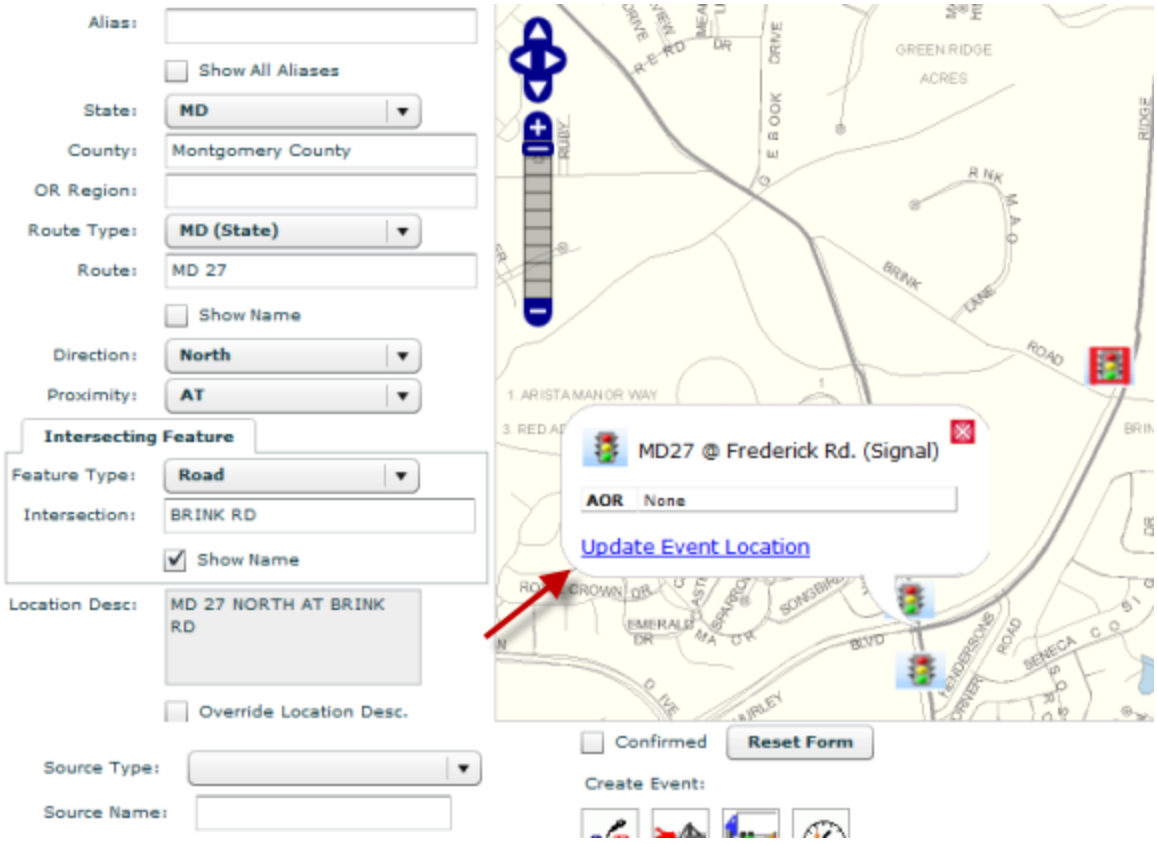


Figure 4-39 Specify Event Location Using Traffic Signal

4.2.3 Action Event / Traffic Signal Associations

Any traffic signal devices associated with an Action Event are listed in the Action Event Information section on the event details page. Additional traffic signal devices from the Signal Book can be associated with an event by clicking the "Associate Traffic Signals" button on the Action Event details page. This button will display the Associate Traffic Signals page prefilled with traffic signal devices within a default distance of 0.5 miles from the from the Action Event.

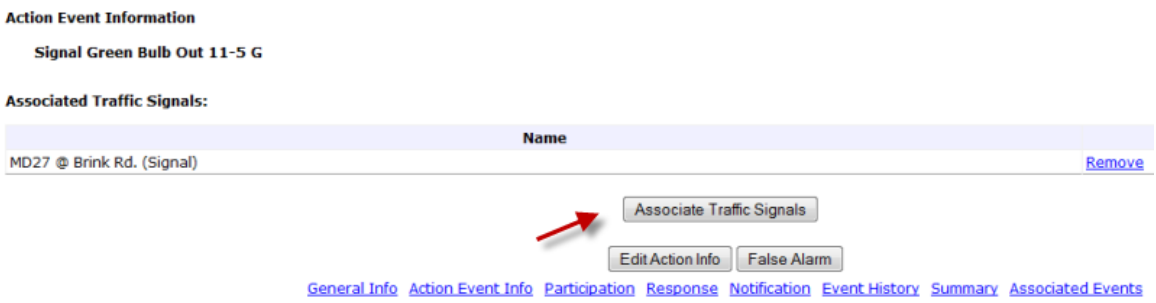


Figure 4-40 Associating Signals to Action Event

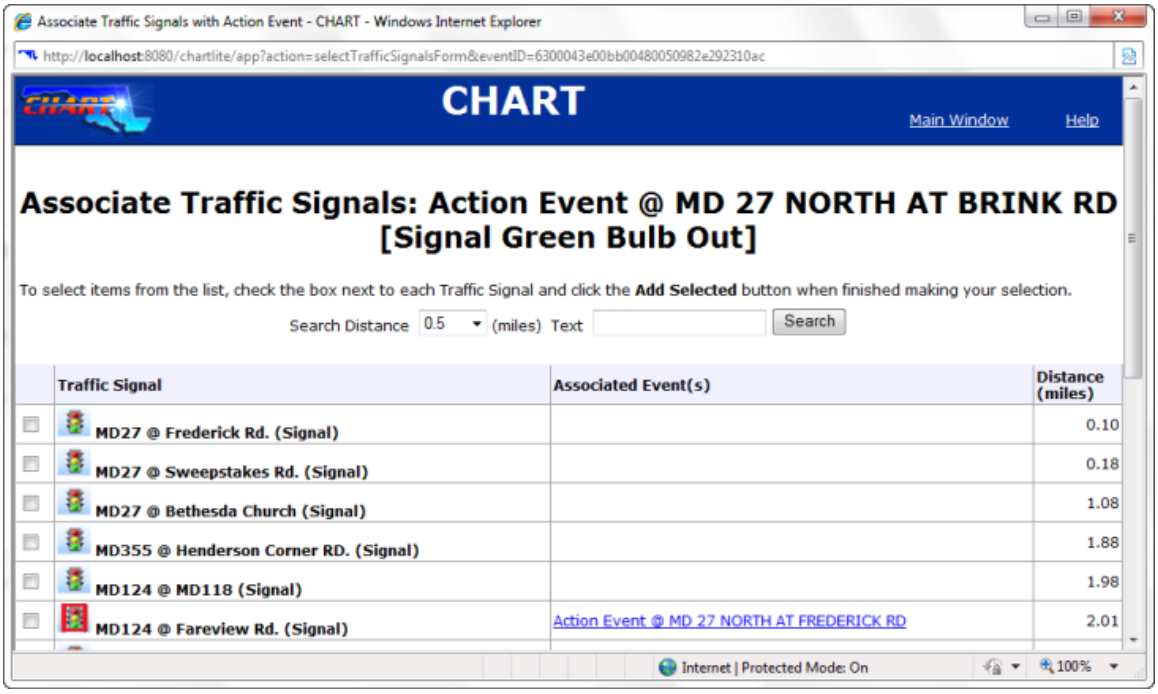


Figure 4-41 Associate Traffic Signals Page

After the initial display of the Associate Traffic Signals page the user may re-query for traffic signal devices by specifying a different distance and/or search text. The Search button will start the new search which may take some time depending on the distance specified. Great care should be taken when searching for signals and the use of a large distance should be avoided if possible.

Users select Traffic Signals using the checkboxes and associate them with the Traffic Event using the "Associate Traffic Signal" button at the bottom of the page.

Any traffic signals that have been erroneously associated with an Action Event can be removed using the "Remove" link on the Associated Traffic Signal section of the event details page. Note: for reporting purposes signals should be removed only when erroneously associated and not just because work on them has completed.

Figure 4-42 Remove Associated Traffic Signal Link

4.2.4 User Defined Traffic Signal Associations

In the rare event that a user does not find a specific traffic signal device using the search capabilities on the Associate Traffic Signals page, he/she can specify a user defined traffic signal to be associated with an Action Event. On the bottom of the Associate Traffic Signals page the user can specify a user defined signal name and associate it with the Traffic Event. This user defined traffic signal only exists in the context of the current Traffic Event and cannot be associated with other Action Events or displayed on the map. Note: Any user defined traffic signals associated with an event will be identified on the event details page with an "*" preceding its name.

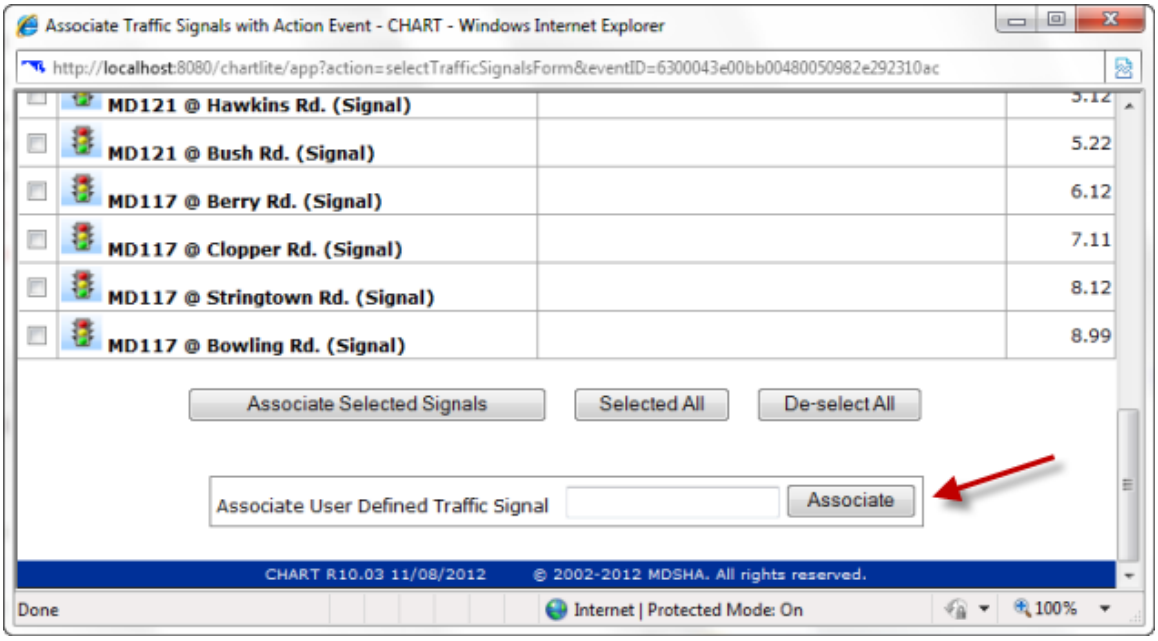


Figure 4-43 Associating a User Defined Signal

4.2.5 Updates to 11 Codes

For CHART R11 the following updates have been made to the 11 codes:

- "Signal 11-13" removed.
- "Signal Red Arrow Out 11-5 RA" added.
- "Walk Sign Out 11-5 W" added.
- "Don't Walk Sign Out 11-5 DW" added.
- Existing 11 Codes have been updated with clearer descriptions.
- Descriptions for 11 codes appended to Action Event names will not include the actual numeric 11 code.
    - Example: "Action Event @ MD 27 NORTH AT BRINK RD [Signal Green Bulb Out]"

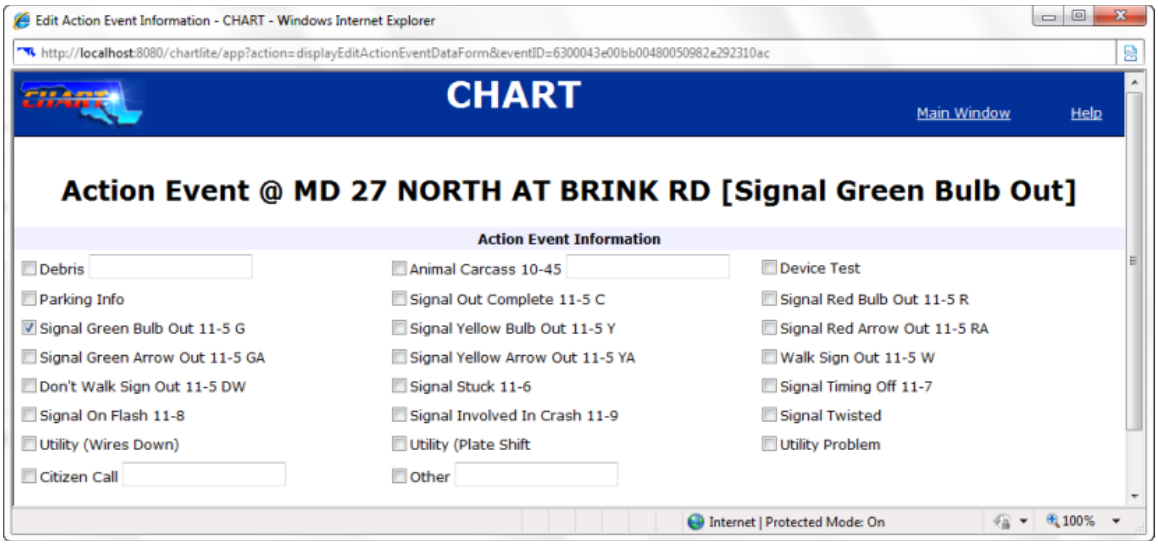


Figure 4-44 Updated Action Required Types

4.3 Decision Support

C:\Users\dbell\Desktop\Decision Support Features.docx
C:\Users\dbell\Desktop\Configuring Devices to be Decision Support Eligible.docx
C:\Users\dbell\Desktop\Configuring Decision Support Settings.docx
C:\Users\dbell\Desktop\Area of Responsibility Related Features.docx

4.4 Send Notification Enhancements

The user interface changes for the Send Notification Enhancements feature are isolated to the Send Notification form, the traffic event details page, and the system profile. See the details in the sections that follow.

4.4.1 Send Notification Form

The send notification form is accessible from the traffic event details page and is used to send e-mail notifications providing details of a traffic event. R11 includes enhancements to this existing form. Note that this form is also accessible for sending notifications outside the context of a traffic event, however that version of the form is simply a subset of this form, with features that are specific to traffic events removed. We will describe the changes to the full featured version of the form, shown below.

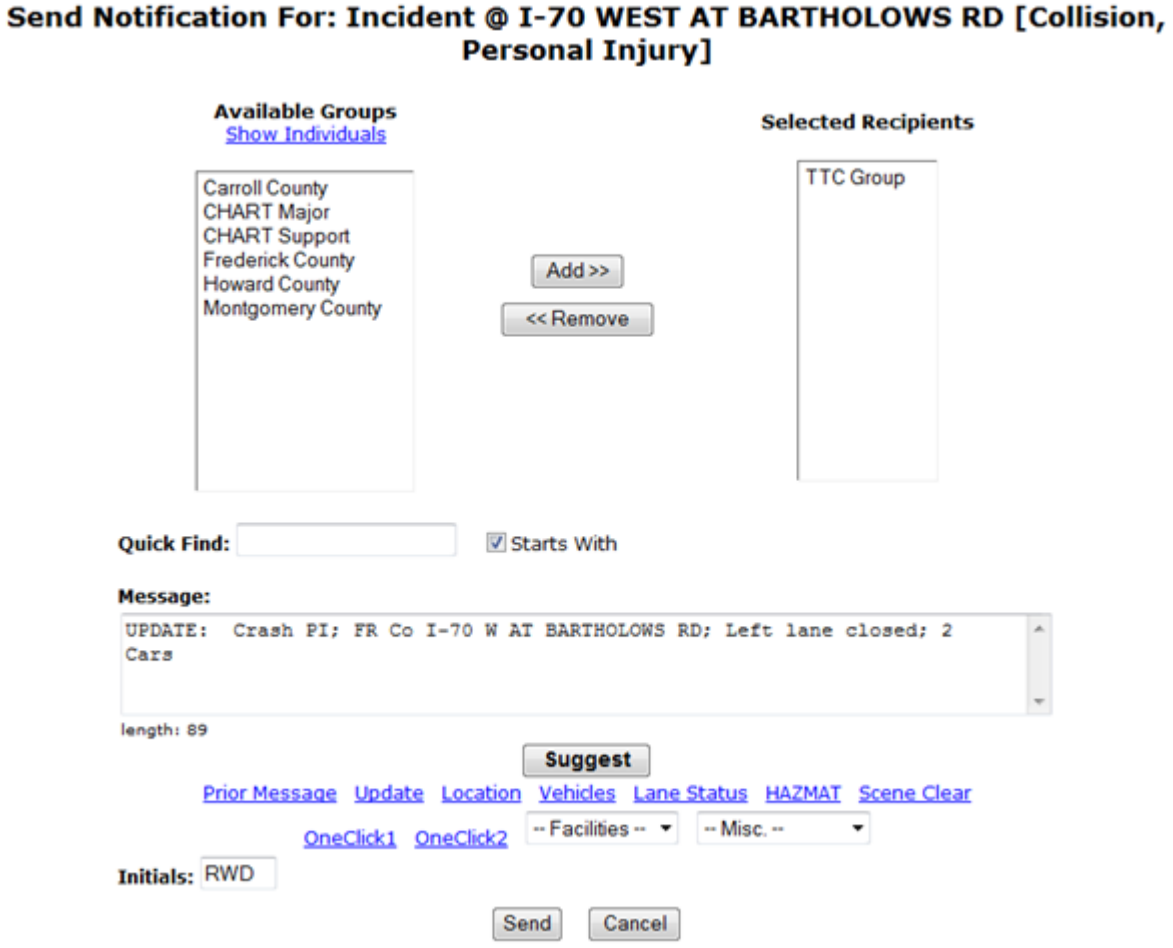


Figure 4-45 Send Notification Form

The following changes will be made to the Send Notification Form as part of CHART R11:

- Follow up notifications from a traffic event will always starts with "UPDATE:". (A follow up notification is any notification sent from the traffic event after an initial notification is sent).

- The existing "Suggest" link has been changed to button and made more prominent. Users are encouraged to use suggested messages to provide consistency among notification messages.
- The previously existing "10" Code short cuts have been removed from the form by disabling the "10" code shortcuts via an existing setting in the system profile. A system administrator can choose to re-enable this feature in the future.
- The previously existing "participants" short cut link will be removed from this form by adding a system profile setting to allow it to be enabled/disabled, and setting the default to disabled. A system administrator can choose to re-enable this feature in the future.
- A new short cut select list has been added for Facilities. This feature can be enabled/disabled in the system profile, and the items that appear in the list can be configured in the system profile. When the user selects an item from the list, its associated text (as configured in the system profile) will be inserted into the notification message text at the current cursor location. Examples of facilities are the Inter-County Connector (ICC) and Fort McHenry Tunnel (FMT).
- The existing "Scene cleared" short cut link has been changed to read (and insert the text) "Scene Clear".
- The existing Initials field is now required. The field must contain at least 1 character before the form can be submitted. Note that existing functionality to store the user's last entry in this field is unchanged.
- Short cuts and suggestion will always insert text into the message at the current cursor location, and using a short cut or suggestion will never clear existing text in the message field.
- Changes to the lane closure description will be made as follows:
    - The lane closure description will no longer describe the lane closures as "x/y lanes closed" (for example 1/4 lanes closed).
    - The lane closure description will no longer consider shoulders and medians. The algorithm will consider all lanes open if only shoulders are closed.
    - When the lane closures exist in the opposing direction, or the traffic event is bi-directional, the direction will be included when describing the lanes closed.
    - If the direction is included in the lane closure description, lanes in direction of the traffic event will be included first.
    - The lane closure description will describe whether the lanes closed are in the center of the road or the left most or right most lanes. When the closed lanes are not adjacent, the description will simply state the number of lanes that are closed without distinguishing left, center, or right.

4.4.2 **Traffic Event Details**

The traffic event details contains a minor change as part of the Send Notification Enhancements feature. The lane closure description that will be used in notification messages is removed from the Roadway Conditions section of this page as shown below:

Figure 4-46 Traffic Event Details - Roadway Conditions

The circled area indicates where this information used to be shown.

4.4.3 System Profile

Several changes will be made to the General Notification Settings section of the system profile:

- New settings will be added to allow Facility short cuts to be defined, and for the facility short cuts to be enabled / disabled.

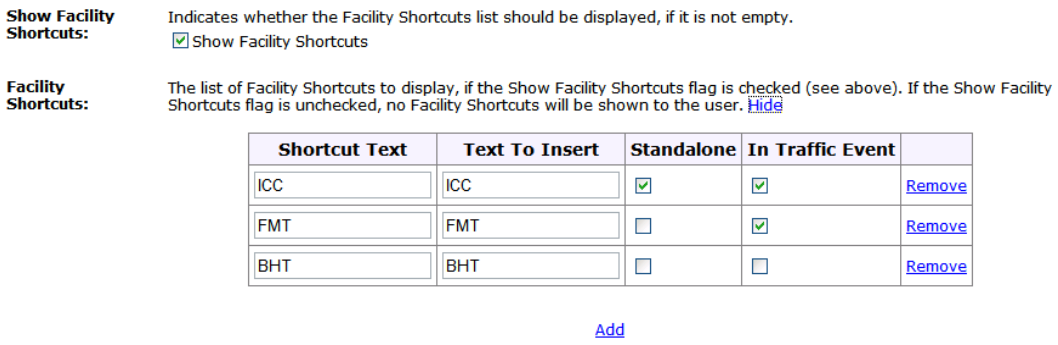


Figure 4-47 System Profile Facility Short Cuts

- A new setting will be added to allow the participants short cut link to be enabled / disabled. This will also control whether or not the participants description will be included in suggested notification messages.
- New settings will be added to allow the abbreviations for All Lanes Open and All Lanes Closed to be defined.

5 Deprecated Functions

The R11 Participant/AVL feature replaces the existing features that allowed "System Participants" to be defined and associated with operations centers. The system now allows event resources and types to be defined and associated with operations centers.

6 Acronyms/Glossary

Area of Responsiblity	A geographic area that can be assigned to an operations center or monitor in order to define a boundary for information that the entity is responsible for/most interested in.
AOR	Area of Resonsibility
Auto AVL Detection	A set of features that uses AVL data to detect when traffic event participants have arrived on the scene of the event, when event participants have departed the scene of the event, and to detect when a specific resource of a requested type has arrived on the scene of the event.
Auto Configured Event Resource	An event resource that has been added to the system automatically based on configuration data in an Event Resource Type and data obtained from the AVL system.
AVL	Automatic Vehicle Location
DMS Display Configuration	Configuration information that pertains to properties of the display characteristics of a DMS, such as its sign type, size, and font.
Event Resource	A resource that can be used as a participant in a traffic event.
Event Resource Type	A type of event resource, which can also be used as a participant in a traffic event.
GIS	**Geographic Information System** (GIS) is any system that captures, stores, analyzes, manages, and presents data that are linked to location
Home Page Map	The map component shown on the home page of the CHART user interface.
Integrated Map	The mapping components that are part of the CHART user interface.
Intranet Map	The CHART Mapping application that is not integrated into the CHART user interface.
Location Alias	A pre-defined location (lat/lon) that has been stored with some name attributes to allow operators to utilize the location repeatedly.
Maintenance Portal	A customized version of the CHART GUI tailored to device maintenance personnel.
Nearby Devices Map	Map shown on the details page for a traffic event that shows only the target traffic event and the devices that are near it.
NTCIP	National Transportation Communications for ITS Protocol. A family of standards designed to achieve interoperability and interchangeability between computers and electronic traffic control equipment from different manufacturers.
Object Location Map	Map component that is used in conjunction with the object location form when setting the location of a traffic event or device.
Open Layers	Open source JavaScript mapping API utilized by the integrated map components in the CHART GUI.
Participant	In the context of a traffic event, an event resource or type that has been assigned to the traffic event.
Participation	In the context of a traffic event, a record of a participant's involvement with the traffic event that includes the notified, arrived/responded, and departed flags / timestamps, in addition to user-entered notes and other data.
REST	Representational State Transfer - a web services architecture style used in CHART that leverages web technologies such as http and XML
RWIS	Roadway Weather Information System
Standard GUI	The CHART GUI when ***not*** accessed via the maintenance portal.
TSS	**Transportation Sensor System**
WMS	A Web Map Service (WMS) is a standard protocol for serving georeferenced map images over the Internet that are generated by a map server using data from a GIS database.

7 Mapping To Requirements

The following table shows how the requirements in the CHART R11 Requirements document map to design elements contained in this design.

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR1	ADMINISTER SYSTEMS AND EQUIPMENT		N/A	N/A
SR1.1	ADMINISTER CHART ORGANIZATIONS, LOCATIONS, AND USERS..		N/A	N/A
SR1.1.1	MAINTAIN CHART ORGANIZATIONS AND GEOGRAPHIC AREAS OF RESPONSIBILITY. The system shall allow the user to separately specify organizations, types of locations, and geographic areas of responsibility, and to associate them to each other.		N/A	N/A
SR1.1.1.4	Maintain Centers		N/A	N/A
SR1.1.1.4.14	The system shall allow a user with the Configure System right to modify the configuration of an existing Center.		N/A (Included for reference)	N/A (Heading)
SR1.1.1.4.14.6	The system shall allow a user with the Configure System right to manage event resources associated with a Center. (MODIFIED FOR R11 - changed response participant to event resource)	Participants	Manage Op Center Event Resources UCD	ResourceManagement CD
SR1.1.1.4.14.6.1	The system shall allow a user with the Configure System right to add an event resource to the set of event resources available for an operations center. (MODIFIED FOR R11 - changed response participant to event resource)	Participants	Associate Event Resources and Types with Op Center	ResourceManagement CD, EventResourceOrTypeSelectionListForCenter.handleFormSubmission CD, EventResourceManagerImpl.setCentersAssociatedWithEventResourceOrType SD
SR1.1.1.4.14.6.1.1	The system shall allow a user with the Configure System right to add a CHART Unit event resource to an operations center. (MODIFIED FOR R11 - changed participant to event resource)	Participants	Associate Event Resources and Types with Op Center	ResourceManagement CD, EventResourceOrTypeSelectionListForCenter.handleFormSubmission CD, EventResourceManagerImpl.setCentersAssociatedWithEventResourceOrType SD
SR1.1.1.4.14.6.1.2	The system shall allow a user with the Configure System right to add a Resource event resource to an operations center. (MODIFIED FOR R11 - changed participant to event resource)	Participants	Associate Event Resources and Types with Op Center	ResourceManagement CD, EventResourceOrTypeSelectionListForCenter.handleFormSubmission CD, EventResourceManagerImpl.setCenter

Tag	Requirement	Feature	Use Cases	Other Design Elements
				sAssociatedWithEventResourceOrTypeSD
SR1.1.1.4.14.6.1.3	The system shall allow a user with the Configure System right to add an Agency event resource to an operations center. (MODIFIED FOR R11 - changed participant to event resource)	Participants	Associate Event Resources and Types with Op Center	ResourceManagement CD, EventResourceOrTypeSelectionListForCenter.handleFormSubmission CD, EventResourceManagerImpl.setCentersAssociatedWithEventResourceOrTypeSD
SR1.1.1.4.14.6.1.4	The system shall allow a user with the Configure System right to add a Special Needs event resource to an operations center. (MODIFIED FOR R11 - changed participant to event resource)	Participants	Associate Event Resources and Types with Op Center	ResourceManagement CD, EventResourceOrTypeSelectionListForCenter.handleFormSubmission CD, EventResourceManagerImpl.setCentersAssociatedWithEventResourceOrTypeSD
SR1.1.1.4.14.6.1.5	The system shall allow a user with the Configure System right to add a Facility event resource to an operations center.	Participants	Associate Event Resources and Types with Op Center	ResourceManagement CD, EventResourceOrTypeSelectionListForCenter.handleFormSubmission CD, EventResourceManagerImpl.setCentersAssociatedWithEventResourceOrTypeSD
SR1.1.1.4.14.6.1.6	The system shall allow a user with the Configure System right to view the available event resources and event resource types that are not associated with the operations center and select one or more resources and/or resource types to associate with the center.	Participants	Associate Event Resources and Types with Op Center	GUIEventResourcesDynListClasses CD, GUIEventResourcesReqHdlrClasses CD, ResourceManagement CD
SR1.1.1.4.14.6.1.6.1	The system shall display the description, type, category, unit name (if applicable), and AVL vehicle (if applicable) for each event resource or event resource type.	Participants	Associate Event Resources and Types with Op Center	GUIEventResourceWrapperDataClasses CD, prototype
SR1.1.1.4.14.6.1.6.2	The system shall allow the user to sort the list of event resources and event resource types by description, type, category, unit name, and AVL vehicle ID.	Participants	Associate Event Resources and Types with Op Center	GUIEventResourcesReqHdlrClasses CD, prototype
SR1.1.1.4.14.6.1.6.3	The system shall allow the user to filter the list of event resources and resource types by type and by category.	Participants	Associate Event Resources and Types with Op Center	GUIEventResourcesReqHdlrClasses CD, prototype
SR1.1.1.4.14.6.6	The system shall allow a user with the Configure System right to remove an event resource from the set of event resources available for an operations center. (MODIFIED FOR R11 - changed resource participant to	Participants	Remove Association of Event Resource or Type from Op Center	GUIEventResourcesReqHdlrClasses CD, ResourceManagement CD

Tag	Requirement	Feature	Use Cases	Other Design Elements
	event resource)			
SR1.1.1.4.14.6.7	The system shall allow a user with the Configure System right to view the event resources currently associated with an op center.	Participants	View Op Center Event Resources	GUIEventResourceWrapperDataClasses CD, prototype
SR1.1.1.4.14.6.7.1	For each event resource associated with an op center, the system shall show the following data as applicable: In Service / Out of Service Indicator, Description, Type, Category, Unit Name, AVL Vehicle, and Camera.	Participants	View Op Center Event Resources	GUIEventResourceWrapperDataClasses CD, prototype
SR1.1.1.4.14.6.7.1.1	The unit name field for an event resource associated with an op center is applicable only if the event resource is configured to allow or require unit name and a unit name has been specified for that resource.	Participants	View Op Center Event Resources	GUIEventResourceWrapperDataClasses CD, prototype
SR1.1.1.4.14.6.7.1.2	The AVL vehicle field for an event resource associated with an op center is applicable only if the event resource is configured to allow or require an AVL vehicle ID and an AVL vehicle ID has been specified for the resource.	Participants	View Op Center Event Resources	GUIEventResourceWrapperDataClasses CD, prototype
SR1.1.1.4.14.6.7.1.3	The camera field for an event resource associated with an op center is applicable only if the event resource is configured to allow camera association and a camera has been associated with the resource.	Participants	View Op Center Event Resources	GUIEventResourceWrapperDataClasses CD, prototype
SR1.1.1.4.14.6.7.1.3.1	The system shall allow the user to navigate to the Camera Details page from the Operations Center Details page, if a camera is associated with an event resource which is associated with the center.	Participants	View Op Center Event Resources	GUIEventResourceWrapperDataClasses CD, prototype
SR1.1.1.4.14.6.7.1.3.2	The system shall allow the user to display a camera in a desktop video window from the Operations Center Details page, if a camera is associated with an event resource which is associated with the center, and if the display on desktop functionality is available from the Camera Details page.	Participants	View Op Center Event Resources	GUIEventResourceWrapperDataClasses CD, prototype
SR1.1.1.4.14.6.7.1.3.3	The system shall allow the user to display a camera on monitors from the Operations Center Details page, if a camera is associated with an event resource which is associated with the center, and if the display on monitors functionality is available from the Camera Details page.	Participants	View Op Center Event Resources	GUIEventResourceWrapperDataClasses CD, prototype

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR1.1.1.4.14.6.7.1.4	The in service / out of service indicator for an event resource associated with an op center is applicable only if the resource is configured to support in service and out of service status.	Participants	View Op Center Event Resources	GUIEventResourceWrapperDataClasses CD, prototype
SR1.1.8	Manage Object Locations		N/A	
SR1.1.8.1	Specify Object Location		N/A	
SR1.1.8.1.1	Specify Object Location Using Form	Map	N/A	
SR1.1.8.1.1.11	The system shall allow the user to pre-populate the location fields by selecting a named location known as a "location alias". (See the Manage Location Aliases requirements).	Map	MapAndGISUses.SelectAliasLocation	GUIAliasServletClasses CD GISModuleClasses CD DiscoverLocationAliasesCommand:execute SD UNCHANGED (Flex)
SR1.1.8.1.1.11.1	The list of location aliases shall be filtered to include only aliases located in the areas of responsibility that are associated with the user's operations center.	Decision Support	View AOR Filtered Aliases	Screenshot: HMI Figure 4-89 Screenshot: HMI Figure 4 90
SR1.1.8.1.1.11.1.1	The list of location aliases shall include all location aliases if no areas of responsibility are associated with the user's operations center.	Decision Support	View AOR Filtered Aliases	Screenshot: HMI Figure 4-89 Screenshot: HMI Figure 4 90
SR1.1.8.1.1.11.2	The system shall allow the user to view the full un-filtered list of location aliases in the system.	Decision Support	View All Aliases	Screenshot: HMI Figure 4-89 Screenshot: HMI Figure 4 90
SR1.4	MANAGE CHART CONTROL		N/A	N/A
SR1.4.2	PERFORM SHIFT HAND-OFF (INCOMING) AND VIEW OPERATIONS CENTER HOME PAGE		N/A	N/A
SR1.4.2.3	The system shall allow the user (once the initial login and shift hand off are complete), to view the Operations Center home page.		N/A	N/A
SR1.4.2.3.7	The home page shall contain an area used to view event resources supporting the in-service / out-of-service flag that are associated with the user's center .	Participants	View Event Resources on Home Page	GUIEventResourcesReqHdlrClasses CD, prototype
SR1.4.2.3.7.1	The system shall filter the event resources view to allow the user to view "Field Units" or to view "Facilities".	Participants	View Event Resources on Home Page	GUIEventResourcesReqHdlrClasses CD, prototype
SR1.4.2.3.7.1.1	The system shall consider an event resource a "Field Unit" for the purpose of display on the home page if the event resource supports in service / out of service status and the event resource supports unit names, and the event resource supports AVL.	Participants	View Event Resources on Home Page	GUIEventResourcesReqHdlrClasses CD, prototype

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR1.4.2.3.7.1.2	The system shall consider an event resource a "Facility" for the purpose of display on the home page if the event resource supports in service / out of service status and the event resource supports unit names, and the event resource does not support AVL.	Participants	View Event Resources on Home Page	GUIEventResourcesReqHdlrClasses CD, prototype
SR1.4.2.3.7.4	The system shall display the following information for each "Field Unit" shown in the home page event resources area, as applicable: An indicator of whether or not the event resource is in service or out of service, the event resource type, the event resource name, the event resource's current location, if available (as detected via GPS), the AVL status, and a list of traffic events to which the event resource is assigned as an event participant.	Participants	View Event Resources on Home Page	GUIEventResourcesReqHdlrClasses CD, prototype
SR1.4.2.3.7.4.1	The system shall indicate if the AVL resource is on scene at the location of an assigned traffic event. (A resource is considered "on scene" for this purpose if its arrived/responded status is set to true, but its departed status is not set to true.)	Participants	View Event Resources on Home Page	GUIEventResourcesReqHdlrClasses CD, prototype
SR1.4.2.3.7.5	The system shall display the following information for each "Facility" shown in the home page event resources area, as applicable: An indicator of whether or not the event resource is in service or out of service, the event resource type, the event resource name, and a list of traffic events to which the event resource is assigned as an event participant.	Participants	View Event Resources on Home Page	GUIEventResourcesReqHdlrClasses CD, prototype
SR1.4.2.3.7.6	The system shall allow the user to toggle the in service / out of service status for each event resource shown in the home page event resources area.	Participants	Toggle Event Resource In Service Status	GUIEventResourcesReqHdlrClasses CD, ResourceManagement CD, setResourceInServiceFlagXML SD, EventResourceManagerImpl.setEvent ResourceServiceStatus SD
SR1.4.2.3.7.6.1	The system shall automatically add a communications log entry when a resource is marked in service or out of service.	Participants	Toggle Event Resource In Service Status	EventResourceManagerImpl.setEvent ResourceServiceStatus SD
SR1.4.2.3.7.7	The system shall allow the user to navigate to the details page for any of the events to which an event resource is assigned, as shown in the event resources	Participants	View Event Resources on Home Page	prototype only

Tag	Requirement	Feature	Use Cases	Other Design Elements
	section of the home page.			
SR1.4.2.3.7.8	The system shall allow the user to navigate to the home page map, zoomed to an event resource that is shown in the event resources section of the home page if the event resource supports AVL and has active AVL data.	Participants	View Event Resources on Home Page	prototype only
SR1.4.2.3.7.9	The system shall allow the list of "Field Units" shown in the event resources section of the home page to be sorted by the in service / out of service status, event resource type, unit name, location, or AVL status.	Participants	Sort Event Resources on Home Page	prototype only
SR1.4.2.3.7.10	The system shall allow the list of "Facilities" shown in the event resources section of the home page to be sorted by the in service / out of service status, event resource type, or unit name.	Participants	Sort Event Resources on Home Page	prototype only
SR1.4.2.3.7.11	The system shall allow the user to search for a field unit by unit name within the list of "Field Units" shown in the event resources section of the home page.	Participants	Search Event Resources on Home Page	prototype only
SR1.4.2.3.7.12	The system shall allow the user to search for a facility by name within the list of "Facilities" shown in the event resources section of the home page.	Participants	Search Event Resources on Home Page	prototype only
SR1.4.2.11	View Operations Center Report		Op Center Report Use Cases UCD	N/A (Heading)
SR1.4.2.11.3	The operations center report shall list all open traffic events that are being controlled by the operations center.	Participants	View Op Center's Open Events	N/A (Existing Functionality)
SR1.4.2.11.3.2	The system shall allow the user to view the number of participants assigned to each traffic event displayed on the operations center report.	Participants	View Event Participants from Event List	GUITrafficEvenWrapperDataClasses CD, prototype
SR1.4.2.11.3.3	The system shall allow the user to view a list showing each participant assigned to a traffic event for any traffic event shown on the operations center report.	Participants	View Event Participants from Event List	GUITrafficEventServletClasses CD (not prototyped for op ctr report)
SR1.4.2.11.3.4	The system shall allow a user with the Manage Traffic Event right to view and toggle the notified, arrived/responded, and departed flags for any participant assigned to a traffic event shown on the operations center report.	Participants	View Event Participants from Event List Specify Traffic Event Participant Status	TrafficEventManagement CD (not prototyped for op ctr report)
SR1.4.2.11.3.4.1	The system shall indicate whether the arrived/responded and departed flags are currently in	Participants	View Event Participants from Event List	GUITrafficEventParticipationDataClasses CD (not prototyped for op ctr

Tag	Requirement	Feature	Use Cases	Other Design Elements
	auto-detection mode or manual mode, if those flags are not set to true, when displaying the participation records for an event on the operations center report.			report)
SR1.4.2.11.3.5	The system shall allow a user with the Manage Traffic Event right to initiate the process of adding participants to a traffic event shown in the operations center report, if the event is of a type that supports participation.	Participants	Add Participants to Traffic Event	GUIEventResourcesReqHdlrClasses CD, TrafficEventManagement CD (not prototyped for op ctr report)
SR1.4.2.11.3.5.1	The system shall allow a user with the Manage Traffic Events right and viewing the operations center report to perform a text search to find event resources and types to add to a traffic event, if the traffic event is of a type that supports participation.	Participants	Add Participants to Traffic Event	GUIEventResourcesDynListClasses2 CD (not prototyped for op ctr report)
SR1.4.2.12	View Home Page		N/A	N/A
SR1.4.2.12.2	View Home Page Map		N/A	N/A
SR1.4.2.12.2.17	The system shall allow the user to view AVL equipped event resources on the home page map.	Participants	View Event Resources on Home Page Map	GUIEventResourceWrapperDataClasses CD, prototype
SR1.4.2.12.2.17.1	The system shall contain a parent layer and child layers for viewing AVL equipped event resources on the home page map.	Participants	View Event Resources on Home Page Map	prototype only
SR1.4.2.12.2.17.2	The system shall allow the user to toggle the parent Event Resources layer to show or hide all child layers that are currently selected to be visible.	Participants	View Event Resources on Home Page Map	prototype only
SR1.4.2.12.2.17.3	The system shall contain a child layer under the Event Resources parent layer for each event resource type defined in the system that supports AVL.	Participants	View Event Resources on Home Page Map	prototype only
SR1.4.2.12.2.17.3.1	The system shall not show an AVL resource type layer if it is zoomed out beyond a configurable zoom level (or equivalent scale or resolution limit).	Participants	View Event Resources on Home Page Map	prototype only
SR1.4.2.12.2.17.4	The system shall display the location of an event resource using the icon(s) configured for the event resource type.	Participants	View Event Resources on Home Page Map	GUIEventResourceWrapperDataClasses CD, prototype
SR1.4.2.12.2.17.4.1	The system shall display the generic icon configured for the event resource type if the event resource does not support in service / out of service.	Participants	View Event Resources on Home Page Map	GUIEventResourceWrapperDataClasses CD, prototype
SR1.4.2.12.2.	The system shall display the in-service icon configured	Participants	View Event Resources on	GUIEventResourceWrapperDataClasse

Tag	Requirement	Feature	Use Cases	Other Design Elements
17.4.2	for the event resource type if the event resource supports in service / out of service, is currently in service, and does not have an associated camera.		Home Page Map	s CD, prototype
SR1.4.2.12.2.17.4.3	The system shall display the in-service with camera icon configured for the event resource type if the event resource supports in service / out of service, is currently in service, and has an associated camera.	Participants	View Event Resources on Home Page Map	GUIEventResourceWrapperDataClasses CD, prototype
SR1.4.2.12.2.17.4.4	The system shall display the out of service icon configured for the event resource type if the event resource supports in service / out of service and is currently out of service.	Participants	View Event Resources on Home Page Map	GUIEventResourceWrapperDataClasses CD, prototype
SR1.4.2.12.2.17.5	The system shall show a tool tip containing the event resource type and the event resource name when the user hovers the mouse over the icon for an event resource that does not overlap other map icons. See SR1.4.9.2 and SR1.4.9.3 for requirements on overlapping icons. (Note if the event resource does not have a unit name specified in CHART, identifying information for the AVL device will be shown instead of the event resource name)	Participants	View Event Resource Map Icon Tool Tip	GUIEventResourceWrapperDataClasses CD, prototype
SR1.4.2.12.2.17.6	The system shall allow the user to click on an Event Resource on the map to display a subset of the available information for the Event Resource.	Participants	View Event Resource Map Popup	prototype only
SR1.4.2.12.2.17.6.1	The system shall show the Event Resource type and name in the map popup for an Event Resource. (The name shown will be the unit name unless the Event Resource does not have a unit name specified, in which case the name will be identifying information for the AVL device)	Participants	View Event Resource Map Popup	GUIEventResourceWrapperDataClasses CD, prototype
SR1.4.2.12.2.17.6.2	The system shall show the Event Resource in service / out of service status in the map popup for an Event Resource if that resource is configured to support in service / out of service status.	Participants	View Event Resource Map Popup	GUIEventResourceWrapperDataClasses CD, prototype
SR1.4.2.12.2.17.6.3	The system shall show the Event Resource location (as text) in the map popup for an Event Resource if the current AVL data for that resource contains the location text.	Participants	View Event Resource Map Popup	GUIEventResourceWrapperDataClasses CD, prototype

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR1.4.2.12.2.17.6.4	The system shall show the Event Resource heading, speed, and AVL data timestamp in the map popup for an Event Resource if included in the current AVL data for that resource.	Participants	View Event Resource Map Popup	GUIEventResourceWrapperDataClasses CD, prototype
SR1.4.2.12.2.17.6.5	The system shall show the name of the camera associated with an Event Resource in the map popup for an Event Resource if that resource is associated with a camera.	Participants	View Event Resource Map Popup	GUIEventResourceWrapperDataClasses CD, prototype
SR1.4.2.12.2.17.6.5.1	The system shall allow the user to navigate to the camera details page for the camera associated with an Event Resource (if any) from the map popup for the Event Resource.	Participants	View Event Resource Map Popup	prototype only
SR1.4.2.12.2.17.6.5.2	The system shall allow the user to launch a desktop video window from an event resource's map popup, if a camera is associated with the event resource and the desktop video functionality is available from the camera's Details page.	Participants	View Event Resource Map Popup	prototype only
SR1.4.2.12.2.17.6.5.3	The system shall allow the user to display a camera on monitors from an event resource's map popup, if a camera is associated with the event resource and the display on monitors functionality is available from the camera's Details page.	Participants	View Event Resource Map Popup	prototype only
SR1.4.2.12.2.17.6.6	The system shall show the name of each event to which the Event Resource is assigned (if any) in the map popup for an Event Resource.	Participants	View Event Resource Map Popup	GUIEventResourceManagerDataClasses CD, prototype
SR1.4.2.12.2.17.6.6.1	The system shall allow the user to navigate to the details page of any event shown in the map popup for an Event Resource.	Participants	View Event Resource Map Popup	prototype only
SR1.4.2.12.2.17.6.6.2	The system shall indicate if the Event Resource is currently on scene at each event shown in the map popup for an Event Resource. (A resource is considered "on scene" for this purpose if its arrived/responded status is set to true, but its departed status is not set to true.)	Participants	View Event Resource Map Popup	GUIEventResourceManagerDataClasses CD, prototype
SR1.5	INSTALL AND MAINTAIN DEVICES		N/A	N/A
SR1.5.2	PUT EQUIPMENT/ DEVICES ON-LINE		N/A	N/A (Heading)
SR1.5.2.1	The system shall allow the user with appropriate rights		N/A (General)	N/A (General)

Tag	Requirement	Feature	Use Cases	Other Design Elements
	to select (or modify) the equipment device parameters.			
SR1.5.2.1.4	The system shall support configuration parameters for DMS devices.	DMS	N/A	N/A (General)
SR1.5.2.1.4.23	Specify DMS Configuration	DMS	N/A	N/A (Heading)
SR1.5.2.1.4.23.42	The system shall allow a suitably privileged user to specify whether a DMS is eligible for decision support message suggestion.	Decision Support	Configure Decision Support Eligible	Screenshot: HMI Figure 4-68 Screenshot: HMI Figure 4-69 Chart2DMSControlClasses CD DMSControlClasses CD GUIDMSDecSuppEligibleClasses CD
SR1.5.2.1.8	The system shall support configuration parameters for HAR devices.	HAR/SHAZAM	Set HAR Configuration	DR1500HARReqHdlr:processEditDR1500HARCtrlSettings SD AddDR1500HARFormData:parseFormData SD DR1500HARReqHdlr:parseHardwareFailureSettings SD
SR1.5.2.1.8.18	The system shall allow a suitably privileged user to specify whether a HAR is eligible for decision support message suggestion.	Decision Support	Configure Decision Support Eligible	Screenshot: HMI Figure 4-70 Screenshot: HMI Figure 4-71 HARControlClasses CD HARControlModuleClasses CD GUIHARDecSuppEligibleClasses CD
SR1.5.5	VIEW DEVICE LISTS		N/A	N/A (Heading)
SR1.5.5.1	The system shall allow the user to view the list of DMSs that exist in the system.	DMS	View DMS List	N/A (Existing)
SR1.5.5.1.4	The system shall allow a user to view the Default DMS List.	DMS		
SR1.5.5.1.4.1	The Default DMS List shall display only DMSs that meet the device filter criteria for the user's operations center.	DMS	Filter Device List by AORs and Folders	GUIDynListServletClasses CD
SR1.5.5.1.4.1.1	The operations center device filter shall include the DMSs contained in the area(s) of responsibility associated with the user's operations center (if any areas of responsibility are associated with the user's operations center).	Decision Support	Filter Device List by AORs and Folders	GUIDynListServletClasses CD
SR1.5.5.1.4.1.2	The operations center device filter shall include the DMSs contained in the user's operations center's	Decision Support	Filter Device List by AORs and Folders	GUIDynListServletClasses CD

Tag	Requirement	Feature	Use Cases	Other Design Elements
	folders (if there are any DMSs in those folders).			
SR1.5.5.1.4.1.3	The operations center device filter shall include all DMSs if no areas of responsibility are associated with the user's operations center and no DMSs are contained in the user's operations center's folders.	Decision Support	Filter Device List by AORs and Folders	GUIDynListServletClasses CD
SR1.5.5.1.4.1.4	The user shall be able to remove the operations center device filter in order to view all DMSs in the system.	Decision Support	Filter Device List by AORs and Folders	GUIDynListServletClasses CD
SR1.5.5.2	The system shall allow the user to view the list of HARs that exist in the system.	HAR/SHAZAM	View HAR List	Use Case Only
SR1.5.5.2.9	The system shall allow a user to view the Default HAR List.	HAR/SHAZAM	View HAR List	
SR1.5.5.2.9.1	The Default HAR List shall display only independent HARs that meet the device filter criteria for the user's operations center.	HAR/SHAZAM	Filter Device List by AORs and Folders	GUIDynListServletClasses CD HARReqHdlr.processViewHARList SD DefaultDynList.getGloballyFilteredSubjects SD
SR1.5.5.2.9.1.1	The operations center device filter shall include the HARs contained in the area(s) of responsibility associated with the user's operations center (if any areas of responsibility are associated with the user's operations center).	Decision Support	Filter Device List by AORs and Folders	GUIDynListServletClasses CD DefaultDynList.getGloballyFilteredSubjects SD
SR1.5.5.2.9.1.2	The operations center device filter shall include the HARs contained in the user's operations center's folders (if there are any HARs in those folders).	Decision Support	Filter Device List by AORs and Folders	GUIDynListServletClasses CD DefaultDynList.getGloballyFilteredSubjects SD
SR1.5.5.2.9.1.3	The operations center device filter shall include all HARs if no areas of responsibility are associated with the user's operations center and no HARs are contained in the user's operations center's folders.	Decision Support	Filter Device List by AORs and Folders	GUIDynListServletClasses CD DefaultDynList.getGloballyFilteredSubjects SD
SR1.5.5.2.9.1.4	The user shall be able to remove the operations center device filter in order to view all HARs in the system.	Decision Support	Filter Device List by AORs and Folders	GUIDynListServletClasses CD DefaultDynList.getGloballyFilteredSubjects SD
SR1.5.5.3	The system shall allow the user to view the list of SHAZAMs that exist in the system.	HAR/SHAZAM	View SHAZAM List	Use Case Only
SR1.5.5.3.4	The system shall allow a user to view the Default SHAZAM list.	HAR/SHAZAM	View SHAZAM List	
SR1.5.5.3.4.1	The Default SHAZAM List shall display only SHAZAMS that meet the device filter criteria for the user's	HAR/SHAZAM	Filter Device List by AORs and Folders	Screenshot: HMI Figure 4-91 GUIDynListServletClasses CD

Tag	Requirement	Feature	Use Cases	Other Design Elements
	operations center.			
SR1.5.5.3.4.1.1	The operations center device filter shall include the SHAZAMs contained in the area(s) of responsibility associated with the user's operations center (if any areas of responsibility are associated with the user's operations center).	Decision Support	Filter Device List by AORs and Folders	Screenshot: HMI Figure 4-91 GUIDynListServletClasses CD
SR1.5.5.3.4.1.2	The operations center device filter shall include the SHAZAMs contained in the user's operations center's folders (if there are any SHAZAMs in those folders).	Decision Support	Filter Device List by AORs and Folders	Screenshot: HMI Figure 4-91 GUIDynListServletClasses CD
SR1.5.5.3.4.1.3	The operations center device filter shall include all SHAZAMs if no areas of responsibility are associated with the user's operations center and no SHAZAMs are contained in the user's operations center's folders.	Decision Support	Filter Device List by AORs and Folders	Screenshot: HMI Figure 4-91 GUIDynListServletClasses CD
SR1.5.5.3.4.1.4	The user shall be able to remove the operations center device filter in order to view all SHAZAMs in the system.	Decision Support	Filter Device List by AORs and Folders	Screenshot: HMI Figure 4-91 Screenshot: HMI Figure 4-92 GUIDynListServletClasses CD
SR1.5.5.5	The system shall allow the user to view the list of Cameras that exist in the system.		View Video Source List	
SR1.5.5.5.4	The system shall by default show only the cameras that meet the device filter criteria for the user's operations center.	Decision Support	Filter Device List by AORs and Folders	GUIDynListServletClasses CD
SR1.5.5.5.4.1	The operations center device filter shall include the cameras contained in the area(s) of responsibility associated with the user's operations center (if any areas of responsibility are associated with the user's operations center).	Decision Support	Filter Device List by AORs and Folders	GUIDynListServletClasses CD
SR1.5.5.5.4.2	The operations center device filter shall include the cameras contained in the user's operations center's folders (if there are any cameras in those folders).	Decision Support	Filter Device List by AORs and Folders	GUIDynListServletClasses CD
SR1.5.5.5.4.3	The operations center device filter shall include all cameras if no areas of responsibility are associated with the user's operations center and no cameras are contained in the user's operations center's folders.	Decision Support	Filter Device List by AORs and Folders	GUIDynListServletClasses CD
SR1.5.5.5.4.4	The user shall be able to remove the operations center device filter in order to view all cameras in the system.	Decision Support	Filter Device List by AORs and Folders	GUIDynListServletClasses CD
SR1.5.6	The system shall provide a device maintenance portal; a view of the system tailored to device maintenance	MaintGUI	Login	ServletBaseClasses CD

Tag	Requirement	Feature	Use Cases	Other Design Elements
	personnel.			
SR1.5.6.7	After login to the device maintenance portal, the system shall show a home page tailored to device maintenance activities.	MaintGUI	Login	processLogin SD
SR1.5.6.7.2	The device maintenance portal home page shall allow the user to view a list of devices.	MaintGUI	View Maintenance Home Page	
SR1.5.6.7.2.12	Device lists shown within the device maintenance portal shall by default be filtered using the filter criteria for the user's operations center.		Filter Device List by AORs and Folders	GUIDynListServletClasses CD
SR1.5.6.7.2.12.1	The operations center device filter shall include the devices contained in the area(s) of responsibility associated with the user's operations center (if any areas of responsibility are associated with the user's operations center).	Decision Support	Filter Device List by AORs and Folders	GUIDynListServletClasses CD
SR1.5.6.7.2.12.2	The operations center device filter shall include the devices contained in the user's operations center's folders (if there are any devices in those folders).	Decision Support	Filter Device List by AORs and Folders	GUIDynListServletClasses CD
SR1.5.6.7.2.12.3	The operations center device filter shall include all devices if no areas of responsibility are associated with the user's operations center and no devices are contained in the user's operations center's folders.	Decision Support	Filter Device List by AORs and Folders	GUIDynListServletClasses CD
SR1.7	MANAGE EVENT RESOURCES	Participants	N/A (Heading)	N/A (Heading)
SR1.7.1	Manage Event Resource Types	Participants	Event Resource Management UCD	N/A (Heading)
SR1.7.1.1	The system shall allow a user with the Manage Event Resources right to add a new event resource type to the system, with attributes listed in the Specify Event Resource Type Attributes requirements.	Participants	Add Event Resource Type	GUIEventResourcesReqHdlrClasses CD, ResourceManagement CD, EventResourceConfigReqHdlr.submitEventResourceTypeForm SD
SR1.7.1.2	The system shall allow a user with the Manage Event Resources right to edit an existing event resource type, with attributes listed in the Specify Event Resource Type Attributes requirements.	Participants	Edit Event Resource Type	GUIEventResourcesReqHdlrClasses CD, ResourceManagement CD, EventResourceConfigReqHdlr.submitEventResourceTypeForm SD
SR1.7.1.3	Specify Event Resource Type Attributes	Participants	Specify Event Resource Type Attributes	N/A (Heading)
SR1.7.1.3.1	The system shall require the user to specify the name of the event resource type.	Participants	Specify Event Resource Type Attributes	ResourceManagement CD, prototype

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR1.7.1.3.2	The system shall require the user to specify the category of the event resource type.	Participants	Specify Event Resource Type Attributes	ResourceManagement CD, prototype
SR1.7.1.3.4	The system shall require the user to specify if by default resources of the type have a unit name.	Participants	Specify Event Resource Type Attributes	ResourceManagement CD, prototype
SR1.7.1.3.4.1	The system shall allow the user to specify that by default resources of the type do not have a unit name.	Participants	Specify Event Resource Type Attributes	ResourceManagement CD, prototype
SR1.7.1.3.4.2	The system shall allow the user to specify that by default resources of the type may have a unit name.	Participants	Specify Event Resource Type Attributes	ResourceManagement CD, prototype
SR1.7.1.3.4.3	The system shall allow the user to specify that by default resources of the type must have a unit name.	Participants	Specify Event Resource Type Attributes	ResourceManagement CD, prototype
SR1.7.1.3.5	The system shall require the user to specify if by default resources of the type have AVL support.	Participants	Specify Event Resource Type Attributes	ResourceManagement CD, prototype
SR1.7.1.3.5.1	The system shall allow the user to specify that by default resources of the type do not have AVL support.	Participants	Specify Event Resource Type Attributes	ResourceManagement CD, prototype
SR1.7.1.3.5.2	The system shall allow the user to specify that by default resources of the type may have AVL support.	Participants	Specify Event Resource Type Attributes	ResourceManagement CD, prototype
SR1.7.1.3.5.3	The system shall allow the user to specify that by default resources of the type must have AVL support.	Participants	Specify Event Resource Type Attributes	ResourceManagement CD, prototype
SR1.7.1.3.6	The system shall allow the user to specify that resources of the type should be automatically configured if the type doesn't require unit name support and the type does have AVL support (allowed or required). (Automatically configured resources are discovered from the AVL system and automatically added to the CHART system as unnamed event resources.)	Participants	Specify Event Resource Type Attributes	ResourceManagement CD, prototype
SR1.7.1.3.6.1	The system shall require the user to enter a text string used to find resources of the specified type within the AVL data if the resource type supports automatic configuration of resources.	Participants	Specify Event Resource Type Attributes	ResourceManagement CD, prototype
SR1.7.1.3.6.2	The system shall automatically add resources of the specified event resource type if a match to the search text is found in the AVL data and the system does not already have a resource with the same AVL vehicle ID.	Participants	Specify Event Resource Type Attributes	EventResourceManagerImpl.avlVehiclesAdded SD
SR1.7.1.3.6.2.1	The system shall make an automatically added AVL resource available to users of all operations centers.	Participants	Specify Event Resource Type Attributes	EventResourceManagerImpl.avlVehiclesAdded SD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR1.7.1.3.6.2.2	The system shall add an automatically configured resource as an AVL-only resource (i.e., without a unit name).	Participants	Specify Event Resource Type Attributes	EventResourceManagerImpl.avlVehiclesAdded SD
SR1.7.1.3.6.3	The system shall automatically remove a previously automatically configured resource of the specified event resource type if the resource is detected to no longer be included in the source of AVL data and has not been included for some configurable amount of time, and if the resource is not used by any online traffic events.	Participants	Specify Event Resource Type Attributes	EventResourceManagerImpl.avlVehiclesRemoved
SR1.7.1.3.7	The system shall allow the user to specify if only the resource type name should be shown when adding participants to a traffic event instead of showing the individual resources of this type, for resources that have AVL vehicle IDs only (i.e., for those resources that do not have unit names).	Participants	Specify Event Resource Type Attributes	ResourceManagement CD, prototype
SR1.7.1.3.8	The system shall allow the user to specify if by default resources of this type support association with a camera.	Participants	Specify Event Resource Type Attributes	ResourceManagement CD, prototype
SR1.7.1.3.9	The system shall allow the user to specify if by default resources of this type support having a status of "in service" or "out of service".	Participants	Specify Event Resource Type Attributes	ResourceManagement CD, prototype
SR1.7.1.3.10	The system shall allow the user to specify the icon(s) to be used to represent resources of a resource type.	Participants	Specify Event Resource Type Attributes	ResourceManagement CD, prototype
SR1.7.1.3.10.1	The system shall allow the user to specify a single icon to represent resources of this type if the type does not support in service / out of service status.	Participants	Specify Event Resource Type Attributes	ResourceManagement CD, prototype
SR1.7.1.3.10.2	The system shall allow the user to specify an icon to represent resources of this type to be used if the resource is in service and does not have an associated camera.	Participants	Specify Event Resource Type Attributes	ResourceManagement CD, prototype
SR1.7.1.3.10.3	The system shall allow the user to specify an icon to represent resources of this type to be used if the resource is in service and has an associated camera.	Participants	Specify Event Resource Type Attributes	ResourceManagement CD, prototype
SR1.7.1.3.10.4	The system shall allow the user to specify an icon to represent resources of this type to be used if the resource is out of service.	Participants	Specify Event Resource Type Attributes	ResourceManagement CD, prototype

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR1.7.1.3.11	The system shall allow the user to specify the operations centers with which the event resource type is associated, if the resource type is used by itself (i.e., instead of being used as an individual resource of that type).	Participants	Specify Event Resource Type Attributes	ResourceManagement CD, prototype, EventResourceConfigReqHdlr.submitEventResourceTypeForm SD
SR1.7.1.3.11.1	The system shall allow the user to specify that an event resource type is associated with ALL operations centers, if the resource type is used by itself (i.e., instead of being used as an individual resource of that type).	Participants	Specify Event Resource Type Attributes	ResourceManagement CD, prototype, EventResourceConfigReqHdlr.submitEventResourceTypeForm SD
SR1.7.1.4	The system shall allow a user with the Manage Event Resources right to remove an event resource type.	Participants	Remove Event Resource Type	GUIEventResourcesReqHdlrClasses CD, ResourceManagement CD
SR1.7.1.4.1	The system shall prohibit the user from removing an event resource type if there are one or more individual event resources of that type.	Participants	Remove Event Resource Type	prototype
SR1.7.1.5	The system shall allow a user with the Manage Event Resources right to view the list of event resource types in the system.	Participants	View Event Resource Types	GUIEventResourcesDynListClasses CD, GUIEventResourcesReqHdlrClasses CD
SR1.7.1.5.1	The system shall allow the user to view the following information for each event resource type: Name, Category, Unit Name Support, AVL Support, In Service Support, Camera Support, and the number of resources of that type that are currently defined in the system.	Participants	View Event Resource Types	GUIEventResourceWrapperDataClasses CD, prototype
SR1.7.1.5.2	The system shall allow the event resource types list to be sorted by Name, Category, Unit Name Support, AVL Support, In Service Support, or Camera Support.	Participants	Sort Event Resource Types	GUIEventResourcesDynListClasses CD, GUIEventResourcesReqHdlrClasses CD, prototype
SR1.7.1.5.3	The system shall allow the user to filter the event resource type list by Category, Unit Name Support, AVL Support, In Service Support, or Camera Support.	Participants	Filter Event Resource Types	GUIEventResourcesDynListClasses CD, GUIEventResourcesReqHdlrClasses CD, prototype
SR1.7.1.5.4	The system shall allow the user to combine filters when viewing the event resource type list.	Participants	Filter Event Resource Types	prototype only
SR1.7.1.5.5	The system shall allow the user to remove an individual filter from the event resource type list.	Participants	Filter Event Resource Types	prototype only
SR1.7.1.5.6	The system shall allow the user to remove all filters from the event resource type list to view all event resource types.	Participants	Filter Event Resource Types	prototype only
SR1.7.1.5.7	The system shall allow the user to show or hide the following columns in the event resource type list:	Participants	View Event Resource Types	GUIEventResourcesReqHdlrClasses CD, prototype

Tag	Requirement	Feature	Use Cases	Other Design Elements
	Category, Unit Name Support, AVL Support, In Service Support, Camera Support, and Num Resources.			
SR1.7.1.5.8	The system shall allow the user to view the default columns if they have other than the default set of columns visible.	Participants	View Event Resource Types	prototype only
SR1.7.1.5.9	The system shall show the following columns in the event resource type list by default: Name, Category, Unit Name Support, AVL Support, In Service Support, Camera Support, Num Resources, and Actions.	Participants	View Event Resource Types	prototype only
SR1.7.2	Manage Individual Event Resources	Participants	Event Resource Management UCD	N/A (Heading)
SR1.7.2.1	The system shall allow a user with the Manage Event Resources right to add a new event resource to the system, with attributes listed in the Specify Event Resource Attributes requirements.	Participants	Add Event Resource	GUIEventResourcesReqHdlrClasses CD, ResourceManagement CD, EventResourceConfigReqHdlr.submitEventResourceForm SD, EventResourceManagerImpl.addEventResource SD
SR1.7.2.2	The system shall allow a user with the Manage Event Resources right to edit an existing event resource, with attributes listed in the Specify Event Resource Type Attributes requirements.	Participants	Edit Event Resource	GUIEventResourcesReqHdlrClasses CD, ResourceManagement CD, EventResourceConfigReqHdlr.submitEventResourceForm SD
SR1.7.2.3	Specify Event Resource Attributes	Participants	Specify Event Resource Attributes	N/A (Heading)
SR1.7.2.3.1	The system shall require the user to specify the event resource type of the event resource.	Participants	Specify Event Resource Attributes	ResourceManagement CD, prototype
SR1.7.2.3.2	The system shall allow the user to specify a unit name for the event resource, if applicable.	Participants	Specify Event Resource Attributes	ResourceManagement CD, prototype
SR1.7.2.3.3	The system shall allow the user to specify an AVL vehicle ID corresponding to the event resource, if applicable.	Participants	Specify Event Resource Attributes	ResourceManagement CD, prototype
SR1.7.2.3.4	The system shall allow the user to specify a camera associated with the event resource, if applicable.	Participants	Specify Event Resource Attributes	ResourceManagement CD, prototype
SR1.7.2.3.5	The system shall allow the user to specify the operations centers with which the event resource is associated.	Participants	Specify Event Resource Attributes	ResourceManagement CD, prototype, EventResourceConfigReqHdlr.submitEventResourceForm SD
SR1.7.2.3.5.1	The system shall allow the user to specify that an event	Participants	Specify Event Resource	ResourceManagement CD, prototype,

Tag	Requirement	Feature	Use Cases	Other Design Elements
	resource is associated with ALL operations centers.		Attributes	EventResourceConfigReqHdlr.submitEventResourceForm SD
SR1.7.2.3.6	The applicability of the unit name, AVL vehicle ID, in-service support, and associated camera attributes shall be based on the settings for the specified event resource type by default.	Participants	Specify Event Resource Attributes	ResourceManagement CD, prototype
SR1.7.2.3.7	The system shall allow the applicability of the unit name, AVL vehicle ID, in-service support, and associated camera attributes to be overridden for an event resource.	Participants	Specify Event Resource Attributes	ResourceManagement CD, prototype
SR1.7.2.4	The system shall allow a user with the Manage Event Resources right to remove an event resource if the resource is not used by any online traffic events.	Participants	Remove Event Resource	GUIEventResourcesReqHdlrClasses CD, ResourceManagement CD, EventResourceManagerImpl.removeEventResource
SR1.7.2.5	The system shall allow a user with the Manage Event Resources right to view the list of event resources in the system.	Participants	View Event Resources	GUIEventResourcesReqHdlrClasses CD, GUIEventResourcesDynListClasses CD
SR1.7.2.5.1	The system shall allow the resource description, type, category, unit name support, unit name, AVL support, AVL vehicle ID, in service support, in service state, camera support, and associated camera to be displayed in the resource list.	Participants	View Event Resources	GUIEventResourceWrapperDataClasses CD, prototype
SR1.7.2.5.2	The system shall allow the resource list to be sorted by resource description, type, category, unit name support, unit name, AVL support, AVL vehicle ID, in service support, in service state, camera support, and associated camera.	Participants	Sort Event Resources	GUIEventResourcesReqHdlrClasses CD, prototype
SR1.7.2.5.3	The system shall allow the event resource list to be filtered by resource type, category, unit name support, AVL support, in service support, in service state, camera support, and associated camera flag.	Participants	Filter Event Resources	GUIEventResourcesReqHdlrClasses CD, prototype
SR1.7.2.5.4	The system shall allow the user to specify the columns to display in the event resource list.	Participants	View Event Resources	GUIEventResourcesReqHdlrClasses CD, prototype
SR1.7.2.5.5	The system shall by default filter out the auto-configured AVL resources so that they are not displayed in the event resource list.	Participants	Filter Event Resources	GUIEventResourcesDynListClasses2 CD, prototype
SR1.7.2.5.6	The system shall allow a user to clear the column filters	Participants	Filter Event Resources	prototype only

Tag	Requirement	Feature	Use Cases	Other Design Elements
	in the event resource list, if any filters have been applied.			
SR1.7.2.5.7	The system shall allow the user to clear all filters in the event resource list, so that all resources are shown.	Participants	Filter Event Resources	prototype only
SR3	MONITOR TRAFFIC AND ROADWAYS		N/A (Heading)	N/A (Heading)
SR3.5	ISSUE NOTIFICATION	Notification	N/A (Heading)	N/A (Heading)
SR3.5.1	The system shall allow a user with the right to Send Notifications to send a notification.	Notification	Send Notification	NotificationManagement CD, NotificationManagerImpl:sendNotification
SR3.5.1.3	The system shall allow a suitably privileged user to send a notification from an open traffic event.	Notification	Send Notification	Use Case Only
SR3.5.1.3.4	The system shall provide a "Suggest" button to generate the notification message from event details.	Event Notification	Suggest Notification Message	Use Case Only
SR3.5.1.3.4.1	The notification suggestion shall contain details about the type of traffic event.	Event Notification	Suggest Notification Message	Use Case Only
SR3.5.1.3.4.1.1	The notification suggestion for an incident event shall contain the type description abbreviation as defined in the system profile.	Event Notification	Suggest Notification Message	Use Case Only
SR3.5.1.3.4.1.2	The notification suggestion for a planned roadway closure event shall include a type description of "Road Work"	Event Notification	Suggest Notification Message	Use Case Only
SR3.5.1.3.4.2	The notification suggestion shall include roadway lane status details.	Event Notification	Suggest Notification Message	Use Case Only
SR3.5.1.3.4.2.1	The notification lane status details shall include closed travel lanes in the direction of the event first, followed by closed travel lanes in the opposite direction of the event.	Event Notification	Add Lane Status to Notification Message	Use Case Only
SR3.5.1.3.4.2.2	The notification lane status details shall not display closed non-travel lanes including shoulders and medians.	Event Notification	Add Lane Status to Notification Message	Use Case Only
SR3.5.1.3.4.2.3	The notification lane status details shall indicate "Center Lane Closed" if a single travel lane is closed on the roadway, between the leftmost and rightmost travel lanes.	Event Notification	Add Lane Status to Notification Message	Use Case Only
SR3.5.1.3.4.2.4	The notification lane status details shall indicate "X Center Lanes Closed", if 2 or more adjacent travel lanes	Event Notification	Add Lane Status to Notification Message	Use Case Only

Tag	Requirement	Feature	Use Cases	Other Design Elements
	are closed between the leftmost and rightmost travel lanes.			
SR3.5.1.3.4.2.5	The notification lane status details shall indicate "All Lanes Closed", if all travel lanes are closed in the direction of the event.	Event Notification	Add Lane Status to Notification Message	Use Case Only
SR3.5.1.3.4.2.6	The notification lane status details shall indicate "Left Lane Closed" or "Right Lane Closed", if a single travel lane is closed and it is the leftmost or rightmost travel lane.	Event Notification	Add Lane Status to Notification Message	Use Case Only
SR3.5.1.3.4.2.7	The notification lane status details shall indicate "X Left Lanes Closed" or "X Right Lanes Closed" if the lane closures are adjacent to each other and include the leftmost or rightmost lane.	Event Notification	Add Lane Status to Notification Message	Use Case Only
SR3.5.1.3.4.2.8	The notification lane status details shall include the direction of lane closures if one or more lanes are closed in each direction.	Event Notification	Add Lane Status to Notification Message	Use Case Only
SR3.5.1.3.4.2.9	The notification lane status details shall include "X Lanes Closed" in the description if non contiguous lanes are closed which cannot be identified as center, left, or right, where X is the number of lanes closed.	Event Notification	Add Lane Status to Notification Message	Use Case Only
SR3.5.1.3.4.2.10	The notification lane status details shall indicate when a toll lane is closed.	Event Notification	Add Lane Status to Notification Message	Use Case Only
SR3.5.1.3.4.2.11	The notification lane status details shall indicate when an exit or ramp is closed.	Event Notification	Add Lane Status to Notification Message	Use Case Only
SR3.5.1.3.4.2.12	The notification lane status details shall indicate when a tunnel lane is closed.	Event Notification	Add Lane Status to Notification Message	Use Case Only
SR3.5.1.3.4.2.13	The notification lane status details shall indicate when a collector/distributor lane is closed	Event Notification	Add Lane Status to Notification Message	Use Case Only
SR3.5.1.3.4.2.14	The notification lane status details shall indicate when an acceleration/deceleration lane is closed.	Event Notification	Add Lane Status to Notification Message	Use Case Only
SR3.5.1.3.4.2.15	The notification lane status details shall indicate when right,center, or left turn lanes are closed.	Notification	Add Lane Status to Notification Message	Use Case Only
SR3.5.1.3.4.2.16	The notification lane status details shall indicate when a merge lane is closed.	Event Notification	Add Lane Status to Notification Message	Use Case Only
SR3.5.1.3.4.3	The notification suggestion shall include "Scene Clear" when the event's scene cleared status has been set.	Event Notification	Suggest Notification Message	Use Case Only

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR3.5.1.3.5	The system shall pre-populate the notification message with the phrase "UPDATE: ", when a follow up notification is sent from an event.	Event Notification	Send Event Notification	Use Case Only
SR3.5.1.7	The system shall allow a user to specify a notification message.	Notification	Send Notification	Use Case Only
SR3.5.1.7.2	The system shall provide typing shortcuts that allow the user to quickly insert text into the message at the current cursor location, for any type of notification.	Notification	Send Notification	Use Case Only
SR3.5.1.7.2.1	The system shall provide an Update shortcut, which inserts the word “Update“ plus a colon plus a space into the message.	Notification, Event Notification	Send Notification	Use Case Only
SR3.5.1.7.2.5	The system shall provide an administrator-configurable shortcut list of “Facilities” shortcuts that allows the user to populate message text using those shortcuts.	Event Notification	Configure Facilities Shortcuts	Use Case Only
SR3.5.1.7.3	The system shall provide typing shortcuts that allow the user to quickly insert text into the message at the current cursor location for a standalone notification started within no particular context.	Notification, Event Notification	Send Notification	Use Case Only
SR3.5.1.7.4	The system shall provide typing shortcuts that allow the user to quickly insert text into the message at the current cursor location for a notification started within the context of a traffic event.	Notification, Event Notification	Send Notification	Use Case Only
SR3.5.1.7.5	The system shall provide typing shortcuts that allow the user to quickly insert text into the message at the current cursor location, for any type of notification.	Notification, Event Notification	Send Notification	Use Case Only
SR3.5.1.8	The system shall require users to specify initials when sending notifications.	Event Notification	Send Notification	Use Case Only
SR4	MANAGE EVENTS		N/A	N/A (Heading)
SR4.1	Record and Update Event Status		N/A	N/A
SR4.1.12	The system shall allow a suitably privileged user to perform all the same editing activities for an event in the Pending state as for an event in the Open state except for those activities which are not relevant for an event in the Pending state.		N/A (Included for Reference)	N/A (Included for Reference)
SR4.1.12.3	The system shall prohibit setting participant notified, arrived/responded and departed times for participants	Participants	Specify Traffic Event Participant Status	prototype

Tag	Requirement	Feature	Use Cases	Other Design Elements
	in a Pending traffic event. (This does not restrict adding or removing participants.)			
SR4.2	OPEN EVENT		N/A	N/A (Heading)
SR4.2.1	The system shall allow a suitably privileged user to create a new event.		Create Traffic Event	N/A (Existing functionality)
SR4.2.1.6	The system shall allow the user to create a new event in the open state from their home page.		Create Traffic Event	N/A (Existing functionality)
SR4.2.1.6.2	The system shall allow the user to specify the source for the new traffic event. [MODIFIED IN R11, removed "type" following "source"]	Participants	Specify Traffic Event Source	N/A (Existing functionality)
SR4.2.1.6.2.1	The system shall allow the user to specify the source type for the new traffic event. [MOVED FROM SR4.2.1.6.2]	Participants	Specify Traffic Event Source	N/A (Existing functionality)
SR4.2.1.6.2.2	The system shall allow the user to specify the source name for the new traffic event when the source type specified is not "Field Unit". (MODIFIED AND MOVED FROM SR4.2.1.6.3)	Participants	Specify Traffic Event Source	prototype only
SR4.2.1.6.2.3	The system shall allow the user to specify the unit name (of an event resource with a unit name) for the new traffic event when the source type specified is "Field Unit".	Participants	Specify Traffic Event Source	prototype only
SR4.2.1.6.12	Create Event At Map Location		NA	
SR4.2.1.6.12.5	The system shall allow the user to initiate the opening of a new traffic event by choosing a Traffic Signal on the map to specify the location of the traffic event. (Used primarily for Action Events.)	Map, Signal	Specify Initial Event Location Using Signal	Map CD, MapReqHdlr.getSignalFeatureJSON SD, MapReqHdlr.getAssociatedSignalFeatureOnlyJSON SD, prototype
SR4.2.1.6.12.5.1	The system shall associate the Traffic Signal used to locate the event with the Action Event if the user chooses to create an Action Event at this location. (Note: If the user manually changes any of the location fields on the create event page after using a Traffic Signal to locate the event, it will not be associated with the created Action Event (as the event will no longer be created using the traffic signal as the source of the event location).)	Map, Signal	Specify Initial Event Location Using Signal, Associate Signal To Traffic Event, Associate Signal At Event Creation	Map CD, SpecifyLocationReqHdlr.getTrafficSignalLocationXML SD, prototype
SR4.2.1.10	The system shall add a response participant to the	Participants	Specify Traffic Event	TrafficEventManagement CD,

Tag	Requirement	Feature	Use Cases	Other Design Elements
	newly created traffic event for the Field Unit specified as the source for the traffic event, if any.		Source	prototype
SR4.2.2	RECORD EVENT DETAILS		N/A	N/A (Heading)
SR4.2.2.5	IDENTIFY EVENT SOURCE			N/A (Heading)
SR4.2.2.5.2	The system shall allow a user with the Manage Traffic Events right to specify the event source for an existing traffic event.	Participants	Specify Traffic Event Source	N/A (Existing functionality)
SR4.2.2.5.2.1	The system shall allow a user with the Manage Traffic Events right to specify a source type for a traffic event, including the special type of "Field Unit".	Participants	Specify Traffic Event Source	Use Case Only
SR4.2.2.5.2.2	The system shall allow a user with the Manage Traffic Events right to specify a source name if the source type is not "Field Unit".	Participants	Specify Traffic Event Source	Use Case Only
SR4.2.2.5.2.3	The system shall allow a user with the Manage Traffic Events right to specify a unit name (of an event resource with a unit name) as the source for a traffic event when the special source type of "Field Unit" is used.	Participants	Specify Traffic Event Source	Use Case Only
SR4.2.2.7	SPECIFY NATURE OF PROBLEM. The system shall allow the user to capture additional details that help determine the severity and type of event, and any additional special conditions. Suggestion to be validated: There are at least three primary aspects to this: Vehicle Type/Count, Incident Type, and lanes affected. The current list in CHART is fairly expansive and should be validated during any scheduled enhancement to this capability.	Signal	N/A	N/A (Heading)
SR4.2.2.7.1	The system shall allow the type of action required to be specified for an Action Event.	Signal	N/A	N/A (unchanged in R10)
SR4.2.2.7.1.24	The selectable action event types shall include Signal Red Arrow 11-5 RA.	Signal	Specify Action Required for Action Event	TrafficEventManagement CD, prototype
SR4.2.2.7.1.25	The selectable action event types shall include Signal Walk 11-5 W.	Signal	Specify Action Required for Action Event	TrafficEventManagement CD, prototype
SR4.2.2.7.1.26	The selectable action event types shall include Signal Don't Walk 11-5 DW.	Signal	Specify Action Required for Action Event	TrafficEventManagement CD, prototype
SR4.2.2.7.8	The system shall allow the user to associate one or	Signal	Associate Signal To Action	GUITrafficEventServletClasses CD,

Tag	Requirement	Feature	Use Cases	Other Design Elements
	more Traffic Signals to an Action Event.		Event	TrafficSignalReqHdlr.associateTrafficSignal SD, TrafficSignalReqHdlr.removeAssociatedSignal SD
SR4.2.2.7.8.1	The system shall allow the user to associate a Traffic Signal with an Action Event from a list of known traffic signals.	Signal	Associate Signal To Action Event, Associate Signal After Event Creation, Associate Signal From SIgnal Book	TrafficSignalReqHdlr.findTrafficSignals SD, TrafficSignalReqHdlr.showSelectTrafficSignalPage SD
SR4.2.2.7.8.2	The system shall allow the user to associate a Traffic Signal with an Action Event by permitting the user to provide the name for a traffic signal to be associated. (Meant to be used in cases where the list of known traffic signals is not complete. (i.e, a user defined traffic signal.)	Signal	Associate Signal To Action Event, Associate Signal After Event Creation, Associate User Defined Signal	TrafficSignalReqHdlr.associateUserDefinedSignal SD
SR4.2.3	DEPLOY RESOURCES. The system shall allow the user to view the pre-defined decision support plans to suggest the course of action and notifications, and execute the selected (or modified) course of action. The ability to record the deploying of the resources only applies to user generated events – not External Events. *		N/A	N/A (Included for context)
SR4.2.3.2	EVALUATE EVENT RESPONSE RECOMMENDATIONS. The system shall display the most appropriate corresponding recommended response plan from the pre-defined decision support plans, based on the event type, conditions, day of week and time of day (e.g., to determine closest open maintenance shop), location, and area of responsibility.		N/A	N/A (Included for context)
SR4.2.3.2.1	The system shall display the recommended DMS, HAR, Detector, CCTV camera and monitor usage and the corresponding message/control, based on the event location		Request suggested cameras.	SD TrafficEventGroup.requestCameraSuggestions
SR4.2.3.2.1.2	The system shall consider all applicable devices located within a configurable radius of the traffic event.	Decision Support	MapAndGISUses.ViewCloseDevicesOnMap MapAndGISUses.ViewDevicesCloseToTrafficEvent	N/A
SR4.2.3.2.1.2.	The system shall include both CHART and external			N/A

Tag	Requirement	Feature	Use Cases	Other Design Elements
3	devices as applicable that are located within the specified radius of the traffic event.			
SR4.2.3.2.1.2.3.1	The system shall suggest messages for CHART DMS devices within a configurable radius of a CHART user created traffic event.	Decision Support	Respond to Traffic Event Use Case: Request Suggested Response Actions	Screenshot: HMI Figure 2 DecisionSupport CD TrafficEventManagement CD TrafficEventManagement2 CD TrafficEventModuleClasses2 CD TrafficEventModule2:initialize SD DecisionSupportManager:getDMSList SD
SR4.2.3.2.1.2.3.1.3	The system shall suggest messages for a CHART DMS device only if the device is eligible for decision support (see SR1.5.2.1.4.23.42).	Decision Support	Suggest DMS Messages	DecisionSupportSvcUtilClasses CD DecisionSupportSvcUtilDMSClasses CD DecisionSupportManager.findPertinentObjects SD
SR4.2.3.2.1.2.3.4	The system shall suggest messages for CHART HAR devices within a configurable radius of a CHART user created traffic event.	Decision Support	Suggest HAR Messages	Screenshot: HMI Figure 4-47 Screenshot: HMI Figure 4-50 DecisionSupportSvcUtilClasses CD HARUtilityDecSuppClasses CD HARUtilityDecSupportTemplateClasses CD TrafficEventModuleClasses CD UtilityObjectCacheTemplatesClasses CD DecisionSupportManager.getLocationAndExitInfo SD HARDSInfo.applyTemplate SD HARDSInfo.generateSuggestions SD TrafficEventGroup.requestSuggestions SD
SR4.2.3.2.1.2.3.4.1	The system shall suggest messages for a CHART HAR device only if the device is eligible for decision support (see SR1.5.2.1.8.18).	Decision Support	Suggest HAR Messages	DecisionSupportSvcUtilClasses CD DecisionSupportSvcUtilHARClasses CD DecisionSupportManager.findPertinentObjects SD
SR4.2.3.2.1.2.3.4.2	The system shall suggest messages for a CHART Synchronized HAR device and all of its constituents if the Synchronized HAR or any of its constituents is within a configurable radius of a CHART user created traffic event.	Decision Support	Suggest Synchronized HAR Messages	DecisionSupportSvcUtilHARClasses CD HARDSPlugin.findPertinentObjects SD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.2.3.2.1.2.3.4.2.1	The system shall suggest messages for a CHART synchronized HAR device only if the synchronized HAR and all of its constituent HARs are eligible for decision support (see SR1.5.2.1.8.18).	Decision Support	Suggest Synchronized HAR Messages	DecisionSupportSvcUtilHARClasses CD HARDSPlugin.findPertinentObjects SD
SR4.2.3.2.1.2.3.4.3	The system shall determine the radius using the configured distance categories and the percentage of lanes closed for the Traffic Event.	Decision Support	Suggest HAR Messages	DecisionSupportSvcUtilHARClasses CD HARDSPlugin.findPertinentObjects SD
SR4.2.3.2.1.2.3.4.3.1	The system shall determine lane closed percentage for directional traffic events (I.E. northbound, southbound) using the percentage of travel lanes in the direction of the traffic event that are closed.	Decision Support	Suggest HAR Messages	DecisionSupportSvcUtilHARClasses CD HARDSPlugin.findPertinentObjects SD
SR4.2.3.2.1.2.3.4.3.2	The system shall determine lane closed percentage for non-directional traffic events (I.E. other, north/south) using the percentage of all travel lanes that are closed.	Decision Support	Suggest HAR Messages	DecisionSupportSvcUtilHARClasses CD HARDSPlugin.findPertinentObjects SD
SR4.2.3.2.1.2.3.4.4	The system shall determine the radius, for traffic event types not supporting lane status, using the max distance of the FAR distance category (Note: See Req 4.2.3.2.9.3 for distance category configuration).	Decision Support	Suggest HAR Messages	DecisionSupportSvcUtilHARClasses CD HARDSPlugin.findPertinentObjects SD
SR4.2.3.2.1.2.3.4.5	Suggested HAR devices shall be scored such that they are displayed in a predictable order.	Decision Support	Suggest HAR Messages	Screenshot: HMI Figure 4-47 Screenshot: HMI Figure 4-50 IDLDecisionSupportClasses CD
SR4.2.3.2.1.2.3.4.5.1	All HARs that are within the configured immediate distance shall be scored higher than those that are not within the immediate distance.	Decision Support	Suggest HAR Messages	Screenshot: HMI Figure 4-47 IDLDecisionSupportClasses CD
SR4.2.3.2.1.2.3.4.5.1.1	HARs within the immediate distance shall be scored by distance from the traffic event regardless of relative proximity (route, direction, upstream/downstream).	Decision Support	Suggest HAR Messages	Screenshot: HMI Figure 4-47 IDLDecisionSupportClasses CD
SR4.2.3.2.1.2.3.4.5.2	All HARs that are within the configured near distance shall be scored higher than those that are not within the configured near distance.	Decision Support	Suggest HAR Messages	Screenshot: HMI Figure 4-50 IDLDecisionSupportClasses CD
SR4.2.3.2.1.2.3.4.5.2.1	HARs within the near and far distance categories shall be scored based on proximity and distance to the traffic event.	Decision Support	Suggest HAR Messages	Screenshot: HMI Figure 4-50 IDLDecisionSupportClasses CD
SR4.2.3.2.1.2.3.4.5.2.1.1	HARs within the near and far distance categories that have a proximity of same route, same direction, upstream shall be scored higher than all other HARs in their respective distance category.	Decision Support	Suggest HAR Messages	Screenshot: HMI Figure 4-50 IDLDecisionSupportClasses CD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.2.3.2.1.2.3.4.5.2.1.2	HARs within the near and far distance categories that have a proximity of same route, same direction, downstream shall be scored lower than all other HARs in their respective distance category.	Decision Support	Suggest HAR Messages	Screenshot: HMI Figure 4-50 IDLDecisionSupportClasses CD
SR4.2.3.2.1.2.3.4.5.3	HARs that are in the configured immediate distance and HARs that have a proximity of same route, same direction, upstream shall be combined and displayed as one list.	Decision Support	Suggest HAR Messages	Screenshot: HMI Figure 4-47
SR4.2.3.2.1.2.9	The system shall not recommend devices whose calculated proximity to the target traffic event is a proximity that is configured to have suggestions disabled. (Note: See Req 4.2.3.2.9.8 for proximity related configuration)	Decision Support	Disable Suggestions Suggest DMS Messages Suggest HAR Messages	None: This was designed and implemented in R9.. This requirement was simply re-worded from "devices" to "DMS devices" since cameras cannot have their proximity values disabled..
SR4.2.3.2.1.2.9.1	The system shall not recommend DMS devices whose calculated proximity to the target traffic event is a proximity that is configured to have suggestions disabled. (Note: See Req 4.2.3.2.9.8 for proximity related configuration)	Decision Support	Suggest DMS Messages	DecisionSupportSvcUtilClasses CD TrafficEventGroup.requestSuggestions SD
SR4.2.3.2.1.2.9.2	The system shall not recommend HAR devices whose calculated proximity to the target traffic event is a proximity that is configured to have suggestions disabled. (Note: See Req 4.2.3.2.9.8 for proximity related configuration)	Decision Support	Suggest HAR Messages	DecisionSupportSvcUtilClasses CD TrafficEventGroup.requestSuggestions SD
SR4.2.3.2.1.2.10	The system shall recommend 0 or more messages for each DMS that meets all device usage criteria.	Decision Support	Respond to Traffic Event Use Case: Request Suggested DMS Messages	Screenshot: HMI Figure 3 Screenshot: HMI Figure 4 DecisionSupportUtility CD DecisionSupportManager:applyTemplate SD DecisionSupportManager:generateSuggestionsForDMS SD DecisionSupportDataClasses CD chartlite.data.trafficevents.DecisionSupport CD chartlite.data.trafficevents_classes CD chartlite.servlet.trafficevents_classes CD

Tag	Requirement	Feature	Use Cases	Other Design Elements
				TrafficEventGroup:requestSuggestions SD ResponsePlanReqHdlr:getSuggDMSActions SD ResponsePlanReqHdlr:viewSuggActionsCommandStatus SD ResponsePlanReqHdlr:viewSuggDMSActions SD
SR4.2.3.2.1.2.10.1	The system shall create DMS message suggestions based on configured message templates.	Decision Support	Respond to Traffic Event Use Case: Request Suggested DMS Messages	DecisionSupportManager:applyTemplate SD DecisionSupportManager:generateSuggestionsForDMS SD ResponsePlanReqHdlr:getSuggDMSActions SD ResponsePlanReqHdlr:viewSuggActionsCommandStatus SD ResponsePlanReqHdlr:viewSuggDMSActions SD
SR4.2.3.2.1.2.10.1.1	The system shall create a DMS message suggestion for each message template that matches the DMS proximity type, distance category, geometry and the type of the traffic event provided that the template tags can successfully be substituted with data from the traffic event as specified in the immediate sub-requirements.	Decision Support	Respond to Traffic Event Use Case: Request Suggested DMS Messages	ResponsePlanReqHdlr:getSuggDMSActions SD ResponsePlanReqHdlr:viewSuggActionsCommandStatus SD ResponsePlanReqHdlr:viewSuggDMSActions SD
SR4.2.3.2.1.2.10.1.1.4	The system shall generate a DMS message suggestion by replacing all words/phrases configured in the word substitutions list and all parameter tags specified in a message template with appropriate DMS and Event values.	Decision Support		DMSDecSupMsgTemplateModel.formatMulti SD DMSDecSupMsgTemplateRow.formatMultiPublic SD DMSDecSupMsgTemplateRow.formatMultiPrivate SD DSTemplateTag.getMulti SD
SR4.2.3.2.1.2.10.1.1.4.3	The system shall generate a lane closure description which will be used as the replacement value for templates containing the current lane closures parameter tag.	Decision Support		DSTemplateTag.getMulti SD Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2.	The system shall include only travel lanes when	Decision		Lane Closure Description Generation

Tag	Requirement	Feature	Use Cases	Other Design Elements
10.1.1.4.3.2	generating a lane closure description for a directional event (N, S, E, W, IL, OL) if 1 or more travel lanes are currently closed.	Support		Flow Chart (Appendix)
SR4.2.3.2.1.2. 10.1.1.4.3.2.8	The system shall consider all lane types that are neither shoulders nor exits as travel lanes (e.g. traffic, toll, tunnel, turn, merge, acceleration, deceleration lanes etc .).	Decision Support	Suggest DMS Messages	Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2. 10.1.1.4.3.3	The system shall only include exit lanes when generating a lane closure description for a directional Event (N, S, E, W, OL, IL) if no travel lanes are currently closed and at least one exit lane is closed.	Decision Support		Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2. 10.1.1.4.3.3.3	The lane closure description shall be "STAY ALERT" (or the text substitute configured for "STAY ALERT") if some but not all left exit lanes are closed and no right exit lanes are closed, provided no other ramps exist on that side of the lane configuration.	Decision Support	Suggest DMS Messages	Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2. 10.1.1.4.3.3.4	The lane closure description shall be "STAY ALERT" (or the text substitute configured for "STAY ALERT") if some but not all right exit lanes are closed and no left exit lanes are closed, provided no other ramps exist on that side of the lane configuration.	Decision Support	Suggest DMS Messages	Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2. 10.1.1.4.3.3.5	The lane closure description shall be "STAY ALERT" (or the text substitute configured for "STAY ALERT") if both left and right exit lane closures exist but not all are closed, or if any entrance ramps exist in the lane configuration.	Decision Support	Suggest DMS Messages	Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2. 10.1.1.4.3.4	The system shall not include shoulders when generating a lane closure description for an event.	Decision Support	Suggest DMS Messages	Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2. 10.1.1.4.3.5	The system shall include only travel lanes when generating a lane closure description for bi-directional (N/S, E/W, OL/IL) events.	Decision Support		Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2. 10.1.1.4.3.5.1	The lane closure description shall be "STAY ALERT" (or the text substitute configured for "STAY ALERT") if some but not all travel lanes are closed (considering travel lanes on both directions of the lane configuration).	Decision Support	Suggest DMS Messages	Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2.	The system shall recommend 0 or more messages for	Decision	Suggest HAR Messages	Screenshot: HMI Figure 4-47

Tag	Requirement	Feature	Use Cases	Other Design Elements
11	each HAR that meets all device usage criteria.	Support		Screenshot: HMI Figure 4-50 DecisionSupportSvcUtilClasses CD HARUtilityDecSuppClasses CD HARUtilityDecSupportTemplateClasses CD TrafficEventModuleClasses CD UtilityObjectCacheTemplatesClasses CD HARDSInfo.applyTemplate SD HARDSInfo.generateSuggestions SD TrafficEventGroup.requestSuggestions SD
SR4.2.3.2.1.2.11.1	The system shall create HAR message suggestions based on configured message templates.	Decision Support	Suggest HAR Messages	DecisionSupportSvcUtilClasses CD HARUtilityDecSuppClasses CD HARUtilityDecSupportTemplateClasses CD TrafficEventModuleClasses CD UtilityObjectCacheTemplatesClasses CD HARDSInfo.applyTemplate SD HARDSInfo.generateSuggestions SD TrafficEventGroup.requestSuggestions SD
SR4.2.3.2.1.2.11.1.1	The system shall create a HAR message suggestion for each message template that matches the HAR proximity type, distance category, and the type of the traffic event provided that the template tags can successfully be substituted with data from the traffic event as specified in the sub-requirements.	Decision Support	Suggest HAR Messages	DecisionSupportSvcUtilClasses CD HARUtilityDecSuppClasses CD HARUtilityDecSupportTemplateClasses CD TrafficEventModuleClasses CD UtilityObjectCacheTemplatesClasses CD HARDSInfo.applyTemplate SD HARDSInfo.generateSuggestions SD
SR4.2.3.2.1.2.11.1.1.1	The system shall disregard a message template when generating message suggestions for a traffic event if the message template contains a route name parameter tag and the system has been configured to not show route names for the route type of the route the traffic event is located on.	Decision Support	Suggest HAR Messages	HARDSInfo.generateSuggestions SD
SR4.2.3.2.1.2.11.1.1.2	The system shall disregard a message template when generating message suggestions for an Event if the message template contains a route type and/or route number parameter tag and the system has been configured to not show route type/number for the	Decision Support	Suggest HAR Messages	HARDSInfo.generateSuggestions SD

Tag	Requirement	Feature	Use Cases	Other Design Elements
	Event's route type.			
SR4.2.3.2.1.2.11.1.1.3	The system shall disregard a message template when generating message suggestions for an Event if the message template contains a route direction parameter tag but no replacement value for the Event's route direction type has been configured in the system.	Decision Support	Suggest HAR Messages	HARDSInfo.generateSuggestions SD
SR4.2.3.2.1.2.11.1.1.4	The system shall generate a HAR message suggestion by replacing all words/phrases configured in the word substitutions list and all parameter tags specified in a message template with appropriate HAR and Event values.	Decision Support	Suggest HAR Messages	HARUtilityDecSuppClasses CD HARUtilityDecSupportTemplateClasses CD HARDSInfo.applyTemplate SD
SR4.2.3.2.1.2.11.1.1.4.1	The system shall use the DMS long replacement value for a word/phrase if no HAR replacement value has been configured for that word/phrase.	Decision Support	Suggest HAR Messages	HARUtilityDecSuppClasses CD HARUtilityDecSupportTemplateClasses CD HARDSInfo.applyTemplate SD
SR4.2.3.2.1.2.11.1.1.4.2	The system shall remove a word/phrase from the message suggestion, leaving no extraneous blanks, if the value configured for the word/phrase is blank.	Decision Support	Suggest HAR Messages	HARUtilityDecSuppClasses CD HARUtilityDecSupportTemplateClasses CD HARDSInfo.applyTemplate SD
SR4.2.3.2.1.2.11.1.1.4.3	The system shall generate a lane closure description which will be used as the replacement value for templates containing the current lane closures parameter tag.	Decision Support	Suggest HAR Messages	HARUtilityDecSuppClasses CD HARUtilityDecSupportTemplateClasses CD HARDSInfo.applyTemplate SD
SR4.2.3.2.1.2.11.1.1.4.3.1	The system shall generate a lane closure description that describes the lanes affected in the direction of the traffic event.	Decision Support	Suggest HAR Messages	HAR Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2.11.1.1.4.3.2	The system shall include only travel lanes when generating a lane closure description for a directional event (N, S, E, W, IL, OL) if 1 or more travel lanes are currently closed.	Decision Support	Suggest HAR Messages	HAR Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2.11.1.1.4.3.2.1	The lane closure description shall be "THE LEFT LANE IS " followed by the configured closure word for the event type (see SR4.2.3.2.9.10), if the leftmost travel lane is closed.	Decision Support	Suggest HAR Messages	HAR Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2.11.1.1.4.3.2.2	The lane closure description shall be "THE RIGHT LANE IS " followed by the configured closure word for the event type (see SR4.2.3.2.9.10), if the rightmost travel lane is closed.	Decision Support	Suggest HAR Messages	HAR Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2.	The lane closure description shall be "ALL LANES ARE "	Decision	Suggest HAR Messages	HAR Lane Closure Description

Tag	Requirement	Feature	Use Cases	Other Design Elements
11.1.1.4.3.2.3	followed by the configured closure word for the event type (see SR4.2.3.2.9.10), if all travel lanes are closed.	Support		Generation Flow Chart (Appendix)
SR4.2.3.2.1.2. 11.1.1.4.3.2.4	The lane closure description shall be "n LEFT LANES ARE " followed by the configured closure word for the event type (see SR4.2.3.2.9.10), if multiple contiguous travel lanes are closed and are grouped all the way to the left (n = number of lanes closed).	Decision Support	Suggest HAR Messages	HAR Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2. 11.1.1.4.3.2.5	The lane closure description shall be "n RIGHT LANES ARE " followed by the configured closure word for the event type (see SR4.2.3.2.9.10), if multiple contiguous travel lanes are closed and are grouped all the way to the right (n = number of lanes closed).	Decision Support	Suggest HAR Messages	HAR Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2. 11.1.1.4.3.2.6	The lane closure description shall be "THE CENTER LANE IS " or "THE CENTER LANES ARE " and the configured closure word for the event type (see SR4.2.3.2.9.10), if travel lane closures are contiguous but not grouped all to the left or all to the right.	Decision Support	Suggest HAR Messages	HAR Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2. 11.1.1.4.3.2.7	The lane closure description shall be "STAY ALERT" (or the text substitute configured for "STAY ALERT") if travel lane closures are non-contiguous.	Decision Support	Suggest HAR Messages	HAR Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2. 11.1.1.4.3.2.8	The system shall consider all lane types that are neither shoulders nor exits as travel lanes (e.g. traffic, toll, tunnel, turn, merge, acceleration, deceleration lanes etc .).	Decision Support	Suggest HAR Messages	HAR Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2. 11.1.1.4.3.3	The system shall only include exit lanes when generating a lane closure description for a directional Event (N, S, E, W, OL, IL) if at least one exit lane is closed.	Decision Support	Suggest HAR Messages	HAR Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2. 11.1.1.4.3.3.1	The lane closure description shall be "THE LEFT EXIT IS " followed by the configured closure word for the event type (see SR4.2.3.2.9.10), if all left exit lanes are closed and no right exit lanes are closed, provided no other ramps exist on that side of the lane configuration.	Decision Support	Suggest HAR Messages	HAR Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2. 11.1.1.4.3.3.2	The lane closure description shall be "THE RIGHT EXIT IS " followed by the configured closure word for the event type (see SR4.2.3.2.9.10), if all right exit lanes are closed and no left exit lanes are closed, provided no	Decision Support	Suggest HAR Messages	HAR Lane Closure Description Generation Flow Chart (Appendix)

Tag	Requirement	Feature	Use Cases	Other Design Elements
	other ramps exist on that side of the lane configuration.			
SR4.2.3.2.1.2.11.1.1.4.3.3.3	The lane closure description shall be "STAY ALERT" (or the text substitute configured for "STAY ALERT") if some but not all left exit lanes are closed and no right exit lanes are closed, provided no other ramps exist on that side of the lane configuration.	Decision Support	Suggest HAR Messages	HAR Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2.11.1.1.4.3.3.4	The lane closure description shall be "STAY ALERT" (or the text substitute configured for "STAY ALERT") if some but not all right exit lanes are closed and no left exit lanes are closed, provided no other ramps exist on that side of the lane configuration.	Decision Support	Suggest HAR Messages	HAR Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2.11.1.1.4.3.3.5	The lane closure description shall be "STAY ALERT" (or the text substitute configured for "STAY ALERT") if both left and right exit lane closures exist but not all are closed, or if any entrance ramps exist in the lane configuration.	Decision Support	Suggest HAR Messages	HAR Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2.11.1.1.4.3.3.6	The lane closure description shall be "ALL EXITS ARE " followed by the configured closure word for the event type (see SR4.2.3.2.9.10), if both left and right exit lanes exist and all are closed.	Decision Support	Suggest HAR Messages	HAR Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2.11.1.1.4.3.4	The system shall not include shoulders when generating a lane closure description for an event.	Decision Support	Suggest HAR Messages	HAR Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2.11.1.1.4.3.5	The system shall include only travel lanes when generating a lane closure description for bi-directional (N/S, E/W, OL/IL) events.	Decision Support	Suggest HAR Messages	HAR Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2.11.1.1.4.3.5.1	The lane closure description shall be the direction and the lane closure description for the travel lanes in the direction of the traffic event (if any lanes or exits are closed in the direction of the traffic event) followed by the direction and the lane closure description for the travel lanes in the opposite direction of the traffic event (if any lanes or exits are closed in the opposite direction of the traffic event). The lane closure description for each direction shall be determined based on SR4.2.3.2.1.2.11.1.1.4.3.2 and SR4.2.3.2.1.2.11.1.1.4.3.3 and their sub-requirements.	Decision Support	Suggest HAR Messages	HAR Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2.	The lane closure description shall be "STAY ALERT" (or	Decision	Suggest HAR Messages	HAR Lane Closure Description

Tag	Requirement	Feature	Use Cases	Other Design Elements
11.1.1.4.3.5.1.1	the text substitute configured for "STAY ALERT") if the lane closure description for either direction is determined to be "STAY ALERT".	Support		Generation Flow Chart (Appendix)
SR4.2.3.2.1.2.11.1.1.4.3.5.2	The lane closure description shall be "ALL LANES ARE " followed by the configured closure word for the event type (see SR4.2.3.2.9.10), if all travel lanes are closed in both directions.	Decision Support	Suggest HAR Messages	HAR Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2.11.1.1.4.3.6	The system shall generate a lane closure description of "ALL LANES ARE OPEN" if the Event does not include a lane status or the lane status indicates no closures of travel lanes, exit lanes or shoulders.	Decision Support	Suggest HAR Messages	HAR Lane Closure Description Generation Flow Chart (Appendix)
SR4.2.3.2.1.2.11.1.1.5	The system shall disregard a suggested message (after all tag replacement and all word substitutions / abbreviations have been done) if the message run time exceeds the maximum allowable playback length.	Decision Support	Suggest HAR Messages	HARDSInfo.generateSuggestions SD
SR4.2.3.2.1.2.11.2	The system shall recommend HAR Messages by finding plan items that target the HAR and are contained within plans that are configured to pertain to the specified traffic event type.	Decision Support	Suggest HAR Messages	Screenshot: HMI Figure 4-57 HARDSInfo.generateSuggestions SD
SR4.2.3.2.1.2.11.3	The system shall present all suggested messages for a HAR ordered by a score (highest to lowest) based on specificity of the message suggestion.	Decision Support	Suggest HAR Messages	Screenshot: HMI Figure 4-52 IDLDecisionSupportClasses CD
SR4.2.3.2.1.2.11.3.1	The system shall score a suggestion generated from a template with fewer supported event types higher than one with more supported event types (all other criteria being the same).	Decision Support	Suggest HAR Messages	IDLDecisionSupportClasses CD
SR4.2.3.2.1.2.11.3.2	The system shall score a suggestion generated from a template with more stringent proximity requirements (same route, same dir, upstream) higher than one with less stringent proximity requirements (all other criteria being the same).	Decision Support	Suggest HAR Messages	IDLDecisionSupportClasses CD
SR4.2.3.2.1.2.11.3.3	The system shall score a suggestion generated from a template with fewer supported distance categories higher than one with more supported distance categories (all other criteria being the same).	Decision Support	Suggest HAR Messages	IDLDecisionSupportClasses CD
SR4.2.3.2.1.2.11.3.4	The system shall score a suggestion generated from a template with more parameter tags higher than one	Decision Support	Suggest HAR Messages	IDLDecisionSupportClasses CD

Tag	Requirement	Feature	Use Cases	Other Design Elements
	with less parameter tags (all other criteria being the same).			
SR4.2.3.2.1.2.11.3.5	The system shall display summary scoring information about a message suggestion indicating the number of parameter tags and template filters (ex. proximity, distance category) matched during scoring.	Decision Support	Suggest HAR Messages	IDLDecisionSupportClasses CD
SR4.2.3.2.1.2.11.3.5.1	The system shall display detailed scoring information about a message suggestion, if requested by the user, indicating which parameter tags and template filters matched during scoring.	Decision Support	Suggest HAR Messages	Screenshot: HMI Figure 4-52 IDLDecisionSupportClasses CD
SR4.2.3.2.1.5	The system shall allow an operator to request suggestions for devices currently in a traffic event response plan.	Decision Support	Use Case: Request Suggested Message for Response Plan Devices	Screenshot: HMI Figure 17 chartlite.data.trafficevents_classes CD
SR4.2.3.2.1.5.3	The system shall allow the operator to request suggested messages for all HAR devices currently in a traffic event response plan.	Decision Support	Request Suggested Device Messages	Screenshot: HMI Figure 4-61 DeviceUtilityMiscClasses CD GUIDecSuppDataClasses CD GUIDecSuppResponseClasses CD ResponsePlanReqHdlr.processSuggestionsForResponse SD
SR4.2.3.2.1.5.4	The system shall allow the operator to request suggested messages for only the HAR devices currently in a traffic event response plan that have no planned message.	Decision Support	Request Suggested Device Messages	Screenshot: HMI Figure 4-61 DeviceUtilityMiscClasses CD GUIDecSuppDataClasses CD GUIDecSuppResponseClasses CD ResponsePlanReqHdlr.processSuggestionsForResponse SD
SR4.2.3.2.1.5.5	The system shall suggest messages for devices that are eligible for decision support (see SR1.5.2.1.4.23.42 and SR1.5.2.1.8.18).	Decision Support	Request Suggested Device Messages	DeviceUtilityMiscClasses CD GUIDecSuppDataClasses CD GUIDecSuppResponseClasses CD GUIHARDecSuppEligibleClasses CD ResponsePlanReqHdlr.processSuggestionsForResponse SD
SR4.2.3.2.1.9	The system shall recommend removing/revoking any device that is currently in the response plan but which did not generate any suggestions based on the current conditions. The default will be to revoke the device.	Decision Support	Suggest Revoking Removing Devices from Response	Screenshot: HMI Figure 4-64 GUIDecSuppDataClasses CD GUIDecSuppRemovalClasses CD GUIResponsePlanServletClasses CD ResponsePlanReqHdlr.processSuggestionsForResponse SD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.2.3.2.1.10	The system shall allow a user with the respond to traffic event right to choose to revoke a response plan item for a DMS or HAR device that is recommended to be revoked from the response plan of the event.	Decision Support	Revoke Remove Devices from Response Revoke Remove DMSs from Response Revoke Remove HARs from Response	Screenshot: HMI Figure 4-64 GUIDecSuppDataClasses CD GUIDecSuppRemovalClasses CD GUIResponsePlanServletClasses CD ResponsePlanReqHdlr.processSuggestionsForResponse SD
SR4.2.3.2.1.11	The system shall allow a user with the respond to traffic event right to choose to remove a response plan item for a device that is recommended to be removed from the response plan of the event.	Decision Support	Revoke Remove Devices from Response Revoke Remove DMSs from Response Revoke Remove HARs from Response Remove Cameras from Response	Screenshot: HMI Figure 4-64 GUIDecSuppDataClasses CD GUIDecSuppRemovalClasses CD GUIResponsePlanServletClasses CD ResponsePlanReqHdlr.processSuggestionsForResponse SD
SR4.2.3.2.1.12	The system shall allow a user with the respond to traffic event right to apply multiple suggestion types in a single action (DMS, HAR, Camera, and/or Removal) to the response plan of the event.	Decision Support	Revoke Remove Devices from Response Use Suggested Response Action	Screenshot: HMI Figure 4-54 GUIDecSuppDataClasses CD GUIDecSuppRemovalClasses CD GUIResponsePlanServletClasses CD ResponsePlanReqHdlr.processSuggestionsForResponse SD
SR4.2.3.2.9	The system shall allow a user with the configure system right to configure decision support settings.	Decision Support	N/A	N/A (unchanged in R10)
SR4.2.3.2.9.2	A user with the configure system right shall be allowed to maintain a system wide list of approved word substitutions and abbreviations to be utilized when suggesting device message content	Decision Support	Configure Decision Support Use Case: Configure Word Substitution	Screenshot: HMI Figure 31 Screenshot: HMI Figure 32
SR4.2.3.2.9.2.4	A user shall be able to specify a value of the HAR substitution / abbreviation for a word/phase in the list.	Decision Support	Configure HAR Word Substitution	Screenshot: HMI Figure 4-80 Screenshot: HMI Figure 4-81 DeviceUtilityMiscClasses CD
SR4.2.3.2.9.5	A user with the configure system right shall be able to configure the word(s) to use in suggested message content for each possible traffic event type.	Decision Support	Configure Decision Support Use Case: ConfigureTagReplacements Configure Decision Support Use Case: ConfigureEventTypeTagReplacements	Screenshot: HMI Figure 33
SR4.2.3.2.9.5.2	A user shall be able to specify the word to use for the traffic event type in HAR messages.	Decision Support	Configure HAR Traffic Event Type Tag	Screenshot: HMI Figure 4-83 DeviceUtilityMiscClasses CD

Tag	Requirement	Feature	Use Cases	Other Design Elements
			Replacements	
SR4.2.3.2.9.6	A user with the configure system right shall be able to configure the word(s) to use in suggested message content for each possible Incident type.	Decision Support	Configure Decision Support Use Case: ConfigureTagReplacements Configure Decision Support Use Case: ConfigureIncidnetTypeTag Replacements	Screenshot: HMI Figure 33
SR4.2.3.2.9.6.2	A user shall be able to specify the word to use for the incident type in HAR messages.	Decision Support	Configure HAR Incident Type Replacements	Screenshot: HMI Figure 4-84 DeviceUtilityMiscClasses CD
SR4.2.3.2.9.7	A user with the configure system functional right shall be able to maintain a set of message templates that will be used by the system when suggesting message content.	Decision Support	Configure Decision Support UCD: ConfigureMessageTemplate	N/A (unchanged in R10)
SR4.2.3.2.9.7.8	A user with the configure system right shall be able to maintain a set of message templates to be used by the system when suggesting message content for HAR devices.	Decision Support	Configure HAR Message Template Add HAR Message Template Edit HAR Message Template Remove HAR Message Template	Screenshot: HMI Figure 4-76 DeviceUtilityDecSuppClasses CD DeviceUtilityDecSuppTemplateClasses CD MessageTemplateManagementClasses CD MessageTemplateModuleClasses CD GUIDecSuppTemplateClasses CD GUIDecSuppHARServletClasses CD HARReqHdlr.processHARDecSuppMsgTemplateEditorSubmit SD WebMessageTemplateFactoryWrapper.createHARDecSuppMsgTemplate SD MessageTemplateFactoryImpl.createHARMsgTemplate SD
SR4.2.3.2.9.7.8.1	A user with the configure system right shall be able to use a HAR message editor to create a HAR message template that consists of static text and parameter tags.	Decision Support	Configure HAR Message Template Add HAR Message Template Edit HAR Message Template	Screenshot: HMI Figure 4-77 Screenshot: HMI Figure 4-79 DeviceUtilityDecSuppClasses CD DeviceUtilityDecSuppTemplateClasses CD MessageTemplateManagementClasses CD MessageTemplateModuleClasses CD GUIDecSuppTemplateClasses CD GUIDecSuppHARServletClasses CD

Tag	Requirement	Feature	Use Cases	Other Design Elements
				HARReqHdlr.processHARDecSuppMsg TemplateEditorSubmit SD WebMessageTemplateFactoryWrappe r.createHARDecSuppMsgTemplate SD MessageTemplateFactoryImpl.createH ARMsgTemplate SD
SR4.2.3.2.9.7. 8.1.1	A user with the configure system functional right shall be able to specify traffic event type as a HAR message template parameter tag.	Decision Support	Add HAR Message Template Edit HAR Message Template	Screenshot: HMI Figure 4-77 DeviceUtilityDecSuppTemplateClasses CD
SR4.2.3.2.9.7. 8.1.2	A user with the configure system functional right shall be able to specify incident type as a HAR message template parameter tag.	Decision Support	Add HAR Message Template Edit HAR Message Template	Screenshot: HMI Figure 4-77 DeviceUtilityDecSuppTemplateClasses CD
SR4.2.3.2.9.7. 8.1.2.1	The system shall automatically set the template event type applicability to incident (and no other types) when the incident type parameter tag is used in the template content.	Decision Support	Add HAR Message Template Edit HAR Message Template	Screenshot: HMI Figure 4-77 DeviceUtilityDecSuppTemplateClasses CD
SR4.2.3.2.9.7. 8.1.3	A user with the configure system functional right shall be able to specify route type as a HAR message template parameter tag.	Decision Support	Add HAR Message Template Edit HAR Message Template	Screenshot: HMI Figure 4-77 DeviceUtilityDecSuppTemplateClasses CD
SR4.2.3.2.9.7. 8.1.4	A user with the configure system functional right shall be able to specify route number as a HAR message template parameter tag.	Decision Support	Add HAR Message Template Edit HAR Message Template	Screenshot: HMI Figure 4-77 DeviceUtilityDecSuppTemplateClasses CD
SR4.2.3.2.9.7. 8.1.5	A user with the configure system functional right shall be able to specify route name as a HAR message template parameter tag.	Decision Support	Add HAR Message Template Edit HAR Message Template	Screenshot: HMI Figure 4-77 DeviceUtilityDecSuppTemplateClasses CD
SR4.2.3.2.9.7. 8.1.6	A user with the configure system functional right shall be able to specify route direction as a HAR message template parameter tag.	Decision Support	Add HAR Message Template Edit HAR Message Template	Screenshot: HMI Figure 4-77 DeviceUtilityDecSuppTemplateClasses CD
SR4.2.3.2.9.7. 8.1.7	A user with the configure system functional right shall be able to specify proximity to nearest exit as a HAR message template parameter tag.	Decision Support	Add HAR Message Template Edit HAR Message Template	Screenshot: HMI Figure 4-77 DeviceUtilityDecSuppTemplateClasses CD
SR4.2.3.2.9.7. 8.1.8	A user with the configure system functional right shall be able to specify intersecting exit number (always uses intersecting feature 1) as a HAR message template parameter tag.	Decision Support	Add HAR Message Template Edit HAR Message Template	Screenshot: HMI Figure 4-77 DeviceUtilityDecSuppTemplateClasses CD
SR4.2.3.2.9.7. 8.1.9	A user with the configure system functional right shall be able to specify intersecting exit route type (always	Decision Support	Add HAR Message Template Edit HAR	Screenshot: HMI Figure 4-77 DeviceUtilityDecSuppTemplateClasses

Tag	Requirement	Feature	Use Cases	Other Design Elements
	uses intersecting feature 1) as a HAR message template parameter tag. (Route type is "I", "MD", "US", etc.)		Message Template	CD
SR4.2.3.2.9.7.8.1.10	A user with the configure system functional right shall be able to specify intersecting exit route number (always uses intersecting feature 1) as a HAR message template parameter tag.	Decision Support	Add HAR Message Template Edit HAR Message Template	Screenshot: HMI Figure 4-77 DeviceUtilityDecSuppTemplateClasses CD
SR4.2.3.2.9.7.8.1.11	A user with the configure system functional right shall be able to specify intersecting exit road name (always uses intersecting feature 1) as a HAR message template parameter tag.	Decision Support	Add HAR Message Template Edit HAR Message Template	Screenshot: HMI Figure 4-77 DeviceUtilityDecSuppTemplateClasses CD
SR4.2.3.2.9.7.8.1.12	A user with the configure system functional right shall be able to specify distance to nearest exit (in miles) as a HAR message template parameter tag.	Decision Support	Add HAR Message Template Edit HAR Message Template	Screenshot: HMI Figure 4-77 DeviceUtilityDecSuppTemplateClasses CD
SR4.2.3.2.9.7.8.1.13	A user with the configure system functional right shall be able to specify current lane closures as a HAR message template parameter tag.	Decision Support	Add HAR Message Template Edit HAR Message Template	Screenshot: HMI Figure 4-77 DeviceUtilityDecSuppTemplateClasses CD
SR4.2.3.2.9.9	A user with the configure system right shall be able to specify an approved abbreviation for each CHART route direction.	Decision Support	Configure Decision Support Use Case: ConfigureRouteDirectionReplacements	Screenshot: HMI Figure 34
SR4.2.3.2.9.9.2	A user shall be able to specify an approved DMS abbreviation for each CHART route direction.	Decision Support	Configure DMS Route Direction Replacements	Screenshot: HMI Figure 4-85
SR4.2.3.2.9.9.3	A user shall be able to specify an approved HAR abbreviation for each CHART route direction.	Decision Support	Configure HAR Route Direction Replacements	Screenshot: HMI Figure 4-85
SR4.2.3.2.9.10	A user with the configure system right shall be able to configure the word used to signify closed lanes in the context of a lane closure description for each possible traffic event type.	Decision Support	Configure Decision Support Use Case: ConfigureLaneClosureWord	Not Prototyped
SR4.2.3.2.9.10.3	A user shall be able to specify a HAR version of the word.	Decision Support	Configure HAR Lane Closure Word	Screenshot: HMI Figure 4-82
SR4.2.3.3	SELECT/ MODIFY COURSE OF ACTION. The system shall allow the user to accept, modify, or bypass the decision support recommendations for device usage, message, and control; for resource requests and notifications; for equipment type; and for equipment location.		N/A	N/A (Heading / general)
SR4.2.3.3.1	SELECT/ DESELECT RESOURCE OR DEVICE. The system shall allow the user to select or deselect the resources,		N/A	N/A

Tag	Requirement	Feature	Use Cases	Other Design Elements
	equipment, and devices (DMS, HAR, SHAZAM, camera, monitor) that are to be used for the response in CHART events (excludes external events).			
SR4.2.3.3.1.1	The system shall record the event resources and event resource types that participated in the traffic event. (Modified for R11 - was: The system shall record the types of resources used for the incident.)	Participants	Add Participants to Traffic Event	TrafficEventImpl.addResourceOrTypeParticipation SD
SR4.2.3.3.1.3	DELETED - The system shall provide the user with an option to add a one-time participant to an event. (Covered by SR4.2.3.3.1.9 and SR4.2.3.3.1.12)	Participants	N/A (Deleted)	N/A (Deleted)
SR4.2.3.3.1.9	The system shall allow a user with the Manage Traffic Events right to enter any of: a call sign, driver first/last name, and/or a note for a participant assigned to a traffic event.	Participants	Add Participant Notes	GUITrafficEventServletClasses CD, TrafficEventManagement CD, ParticipationReqHdlr.setParticipationNotes SD, prototype
SR4.2.3.3.1.10	The system shall allow a user with the Manage Traffic Events right to select a specific resource as an event participant to replace a generic resource type that was specified as an event participant if that resource type is configured to show the resource type instead of individual resources, and individual resources (without unit names) of that type exist in CHART. (Example: user first adds the generic resource type "Dump Truck", and then later selects a specific dump truck to replace it.)	Participants	Select Specific Event Resource as Participant	TrafficEventManagement CD, GUIEventResourcesDynListClasses CD, EventResourceOrTypeSelectionListForEvent.handleFormSubmission SD, prototype
SR4.2.3.3.1.10.1	The system shall allow a user with the Manage Traffic Events right to select a different specific resource within a participation record if the resource type was previously replaced with a specific resource of the type, regardless of whether the initial replacement was performed by the system or by the user.	Participants	Select Specific Event Resource as Participant	TrafficEventManagement CD, EventResourceOrTypeSelectionListForEvent.handleFormSubmission SD, TrafficEventGroup.setParticipantInResourceOrTypeParticipation SD, prototype
SR4.2.3.3.1.10.2	The system shall allow a user with the Manage Traffic Events right to select the generic resource type again to replace a specific resource within a participation record if the resource type was previously replaced with a specific resource of the type, regardless of whether the initial replacement was performed by the system or by the user.	Participants	Select Specific Event Resource as Participant	TrafficEventManagement CD, EventResourceOrTypeSelectionListForEvent.handleFormSubmission SD, TrafficEventGroup.setParticipantInResourceOrTypeParticipation SD, prototype
SR4.2.3.3.1.11	The system shall clear the arrived/responded and	Participants	Select Specific Event	TrafficEventGroup.setParticipantInRes

Tag	Requirement	Feature	Use Cases	Other Design Elements
0.3	departed flags for a participation record if the user replaces the specific resource represented by the participation with a different specific resource or the resource type, but only if the arrived/responded and departed flags were automatically set (i.e., if they were manually set by a user, they will not be cleared).		Resource as Participant	ourceOrTypeParticipation SD
SR4.2.3.3.1.12	The system shall allow a user with the Manage Traffic Events right to add event resources as participants to a traffic event from the set of all resources associated with the user's operation center plus the resources associated with the traffic event's controlling operations center, if the traffic event is of a type that supports participation.	Participants	Add Participants to Traffic Event	EventResourceOrTypeSelectionListForEvent.handleFormSubmission SD, EventResourceOrTypeSelectionListForEvent.addParticipationsToEvent SD, TrafficEventImpl.addResourceOrTypeParticipation SD, prototype
SR4.2.3.3.1.12.1	The system shall provide a search capability that can be used when adding participants to a traffic event to minimize the list of event resources and resource types shown for selection to include only those that meet the search criteria.	Participants	Add Participants to Traffic Event	prototype only
SR4.2.3.3.1.12.1.1	If the search text entered for an event resource to add as a participant in a traffic event matches exactly one event resource or event resource type that is available for selection, the system shall automatically add that event resource or event resource type as a participant in the traffic event without requiring user selection.	Participants	Add Participants to Traffic Event	prototype only
SR4.2.3.3.1.12.1.2	The system shall display a selection list of event resources and/or resource types matching the given search text, if more than one match was returned in the search results.	Participants	Add Participants to Traffic Event	GUIEventResourcesReqHdlrClassesCD, GUIEventResourcesDynListClassesCD, prototype
SR4.2.3.3.1.12.1.3	The system shall show search suggestions for event resources and/or resource types matching the partial search text, while the user is typing in text to search for but before an actual search is requested by the user.	Participants	Add Participants to Traffic Event	GUIEventResourcesReqHdlrClassesCD, prototype
SR4.2.3.3.1.12.2	The system shall allow the user to select event resources and/or event resource types to add as participants from a list (i.e., without searching).	Participants	Add Participants to Traffic Event	GUIEventResourcesReqHdlrClassesCD, GUIEventResourcesDynListClassesCD, prototype
SR4.2.3.3.1.12.3	The system shall allow a user with the Manage Traffic Events right to view the available event resources and	Participants	Add Participants to Traffic Event	GUIEventResourcesReqHdlrClassesCD, GUIEventResourceDynListClasses

Tag	Requirement	Feature	Use Cases	Other Design Elements
	event resource types that are available to be added to a traffic event and select one or more resources and/or resource types to add.			CD, prototype
SR4.2.3.3.1.12.3.1	The system shall display the event resource or type description, type, category, distance from the event (if applicable), AVL location description (if applicable), events using the resource (if applicable), and in/out of service status icon (if applicable).	Participants	Add Participants to Traffic Event	GUITrafficEventParticipationDataClasses CD, prototype
SR4.2.3.3.1.12.3.1.1	The system shall indicate if the Event Resource is currently on scene at each event shown in the selection list for adding a resource or type to a traffic event. (A resource is considered "on scene" for this purpose if its arrived/responded status is set to true, but its departed status is not set to true.)	Participants	Add Participants to Traffic Event	prototype only
SR4.2.3.3.1.12.3.2	The system shall allow a user viewing the selection list for adding event resources or types to a traffic event to sort the list by description, type, category, or (if the traffic event has a lat/long specified) distance from the traffic event.	Participants	Add Participants to Traffic Event	GUIEventResourcesReqHdlrClasses CD, GUIEventResourceDynListClasses CD, prototype
SR4.2.3.3.1.12.3.3	The system shall allow a user viewing the selection list for adding event resources or types to a traffic event to filter the list by type, category, or (if the traffic event has a lat/long specified) distance from the traffic event.	Participants	Add Participants to Traffic Event	GUIEventResourcesReqHdlrClasses CD, GUIEventResourceDynListClasses CD, prototype
SR4.2.3.3.1.12.4	The system shall support adding event resources and resource types as participants to a traffic event of type: action event, disabled vehicle, incident, special event, or weather service event.	Participants	Add Participants to Traffic Event	TrafficEventImpl.addResourceOrTypeParticipation SD
SR4.2.3.3.1.12.5	The system shall allow an event resource or resource type that represents an "agency" to be added to a traffic event. (Agencies are typically entities outside of CHART control that can be notified and can respond to an event, but which may or may not go to the scene of the event or report back to CHART when they are departing the scene or are finished responding).	Participants	Add Participants to Traffic Event	Use Case Only (This is implemented via DB population for deployment)
SR4.2.3.3.1.12.6	The system shall allow an event resource or resource type that represents a resource other than an "agency" to be added to a traffic event, including: CHART / field	Participants	Add Participants to Traffic Event	Use Case Only (This is implemented via DB population for deployment)

Tag	Requirement	Feature	Use Cases	Other Design Elements
	units, special needs, and other resources or resource types. (These types of event resources and resource types typically will be notified of the traffic event, arrive at the scene of the event, and report back to CHART when they are departing the scene).			
SR4.2.3.3.7	SELECT DEVICE PLAN OR PLAN ITEMS			
SR4.2.3.3.7.10	The system shall allow the user to add one or more HAR/message combinations suggested by the decision support subsystem to the traffic event response plan.	Decision Support	Add HAR to Response Plan	Screenshot: HMI Figure 4-53 GUIDecSuppDataClasses CD GUIDecSuppResponseClasses CD ResponsePlanReqHdlr.processSuggestionsForResponse SD
SR4.2.3.3.7.10.1	The system shall allow the user to indicate that the HAR/message combination should be executed immediately when it is added to the traffic event response plan.	Decision Support	Add HAR to Response Plan	Screenshot: HMI Figure 4-53 GUIDecSuppDataClasses CD GUIDecSuppResponseClasses CD ResponsePlanReqHdlr.processSuggestionsForResponse SD
SR4.2.3.4	EXECUTE COURSE OF ACTION		N/A	N/A (Heading)
SR4.2.3.4.8	The system shall automatically update the status (with date/timestamp) for each resource participant, device, or equipment once the course of action has been executed. Suggestion/example: "notified" or similar status type.	Participants	Specify Traffic Event Participant Status	Use Case Only
SR4.2.3.5	View Response Plan		N/A	N/A (Heading)
SR4.2.3.5.9	The system shall indicate if the response plan is currently missing a device that decision support rules indicate should be considered for response to the traffic event.	Decision Support	Configure Decision Support Use Case: View Devices That Should Be Considered for Response	Screenshot: HMI Figure 1 Screenshot: HMI Figure 15 chartlite.data.trafficevents_classes CD chartlite.servlet.trafficevents_classes CD
SR4.2.3.5.9.2	The system shall indicate if the response plan is currently missing a HAR device that is within the immediate distance or upstream, same direction and on the same route as a traffic event and is also within the configurable distance.	Decision Support	Preview Response Plan on Map	Screenshot: HMI Figure 4-66
SR4.3	RESPOND TO AND MONITOR EVENT		N/A	N/A (Heading)
SR4.3.1	MONITOR EVENT. The system shall allow the user to view and update the status of devices, resources responding to an event, and the event response		N/A	N/A (General)

Tag	Requirement	Feature	Use Cases	Other Design Elements
	activities.			
SR4.3.1.1	MONITOR RESOURCE STATUS.		N/A	N/A (Heading)
SR4.3.1.1.6	The system shall record the userid and date/timestamp for each user-initiated status change.	Participants	Specify Traffic Event Participant Status	Use Case Only
SR4.3.1.1.8	DELETED - Record Agency Participation (See SR4.4.1.9)	Participants	N/A (Deleted)	N/A (Deleted)
SR4.3.1.1.8.2	The system shall allow a suitably privileged user to record which agencies are involved for an open Action Event.			
SR4.3.1.1.9	Record Event Participant Status	Participants	N/A (Heading)	N/A (Heading)
SR4.3.1.1.9.9	The system shall allow the user to record event participant notification.	Participants	Specify Traffic Event Participant Status	ParticipationReqHdlr.setParticipationStateJSON SD, prototype
SR4.3.1.1.9.10	The system shall allow the user to override the event participant notification Date/Time recorded by the CHART system.	Participants	Specify Traffic Event Participant Status	ParticipationReqHdlr.setParticipationStateJSON SD
SR4.3.1.1.9.11	The system shall allow to user to record that an event participant has arrived/responded.	Participants	Specify Traffic Event Participant Status	ParticipationReqHdlr.setParticipationStateJSON SD, prototype
SR4.3.1.1.9.12	The system shall allow the user to override the event participant arrived/responded Date/Time recorded by the CHART system.	Participants	Specify Traffic Event Participant Status	ParticipationReqHdlr.setParticipationStateJSON SD
SR4.3.1.1.9.13	The system shall allow the user to record that the event participant has departed from the scene.	Participants	Specify Traffic Event Participant Status	ParticipationReqHdlr.setParticipationStateJSON SD, prototype
SR4.3.1.1.9.14	The system shall allow the user to override the event participant departure Date/Time recorded by the CHART system.	Participants	Specify Traffic Event Participant Status	ParticipationReqHdlr.setParticipationStateJSON SD
SR4.3.1.1.9.18	The system shall automatically detect when an event resource assigned as a participant in an open traffic event has arrived on-scene or departed scene and set the participant's status using available AVL data when possible.	Participants	Detect Event Resource On Scene Detect Event Resource Departed Scene	EventResourceManagerImpl.avlDataReceived SD, TrafficEventGroup.performAVLAutoDetection SD, TrafficEventParticipant.performAVLAutoDetection SD
SR4.3.1.1.9.18.1	The system shall not attempt to automatically set a participant's arrived/responded or departed scene status if the user has manually set the arrived/responded or departed scene status (i.e., automatic operation is disabled for both flags, even if the user changed only one of them).	Participants	Detect Event Resource On Scene Detect Event Resource Departed Scene	TrafficEventParticipant.detectArrivedResponded SD, TrafficEventParticipant.detectDeparted SD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR4.3.1.1.9.18.1.1	The system shall indicate to the user whether a participation record is in auto detection mode or manual mode for the arrived/responded and departed flags, if those flags are not yet set to true. The manual indicator will be shown if the automatic detection is not applicable or is disabled for any reason.	Participants	View Traffic Event Participants	prototype
SR4.3.1.1.9.18.3	The system shall mark the participation status as arrived/responded if the corresponding AVL-associated resource is detected to be within the configured "on scene" radius relative to the location of the traffic event, and participant AVL auto detection is allowed (both at the system level and at the traffic event level), and the user has not modified the "arrived/responded" or "departed" states for the participation record.	Participants	Detect Event Resource On Scene	TrafficEventParticipant.detectArrivedResponded SD
SR4.3.1.1.9.18.3.1	The system shall allow a user with the Configure System right to specify a radius to define a circle around a traffic event's lat/long that will be used to determine if a resource is on the scene of the traffic event.	Participants	Detect Event Resource On Scene	UserManagement CD, prototype
SR4.3.1.1.9.18.3.2	The system shall allow a user with the Configure System right to specify an amount of time that a resource must be within the on scene radius to be eligible as a replacement for a resource type participant. (The purpose of this is to attempt to distinguish between resources that are just passing by vs. those actually stopped at the scene.)	Participants	Detect Event Resource On Scene	UserManagement CD, prototype
SR4.3.1.1.9.18.3.3	The system shall automatically replace a resource type within a participation record with a specific resource of that type, if any unnamed AVL-equipped resource of that type was detected to be on scene (i.e., within the configured "on scene" radius for the configured amount of time) and the user has not entered a call sign, driver name, or note for that participant, nor marked the participant arrived/responded or departed, and if participant AVL auto detection is allowed (both at the system level and at the traffic event level).	Participants	Detect Event Resource On Scene	TrafficEventParticipant.detectOnSceneResourceOfType SD
SR4.3.1.1.9.1	The system shall mark the participation status as	Participants	Detect Event Resource	TrafficEventParticipant.detectDeparte

Tag	Requirement	Feature	Use Cases	Other Design Elements
8.4	"departed" when the corresponding AVL-associated resource's location falls outside of the configured "departed" radius relative to the location of the traffic event, if the participation was previously marked as "arrived/responded" but not "departed" and participant AVL auto detection is allowed (both at the system level and at the traffic event level), and the user has not modified the "arrived/responded" or "departed" states for the participation record. (Note there is no grace period for which the resource must remain outside the circle; it will be marked departed as soon as its location is detected to be outside the circle.)		Departed Scene	d SD
SR4.3.1.1.9.1 8.4.1	The system shall allow a user with the Configure System right to specify a radius to define a circle around a traffic event's lat/long that will be used for the purpose of detecting if a resource has departed the scene of the traffic event.	Participants	Detect Event Resource Departed Scene	UserManagement CD, prototype
SR4.3.1.1.9.1 8.8	The system shall allow a user with the Configure System right to specify whether auto-detection of AVL-equipped participants is enabled or disabled at a system-wide level.	Participants	Detect Event Resource On Scene Detect Event Resource Departed Scene	UserManagement CD, TrafficEventGroup.performAVLAutoDetection SD, prototype
SR4.3.1.1.9.1 8.9	The system shall allow a user with the Configure System right to specify whether auto-detection of AVL-equipped participants is enabled or disabled by default on a per-traffic-event level.	Participants	Detect Event Resource On Scene Detect Event Resource Departed Scene	UserManagement CD, prototype
SR4.3.1.1.9.1 8.9.1	The system shall allow a user with the Manage Traffic Events right to specify whether auto-detection of AVL-equipped participants is currently enabled or disabled for a given traffic event.	Participants	Detect Event Resource On Scene Detect Event Resource Departed Scene	TrafficEventManagement CD, GUITrafficEventServletClasses CD, ParticipationReqHdlr.setAVLAutoDetectionEnabledForEvent SD, TrafficEventGroup.performAVLAutoDetection SD, prototype
SR4.3.5	VIEW EVENT LIST		N/A (Header)	N/A (Header)
SR4.3.5.13	The system shall allow the user to view the number of participants assigned to each traffic event displayed in the open or open/closed traffic event list.	Participants	View Event Participants from Event List	GUITrafficEventParticipationDataClasses CD, prototype
SR4.3.5.13.1	The system shall allow the user to view a list showing each participant assigned to any traffic event shown in	Participants	View Event Participants from Event List	GUITrafficEventServletClasses CD, prototype

Tag	Requirement	Feature	Use Cases	Other Design Elements
	the open or open/closed traffic event list.			
SR4.3.5.13.2	The system shall allow a user with the Manage Traffic Event right to view and toggle the notified, arrived/responded, and departed flags for each participant assigned to a traffic event shown in the open or open/closed traffic event list.	Participants	View Event Participants from Event List	ParticipationReqHdlr.setParticipationStateJSON SD, prototype
SR4.3.5.13.2.1	The system shall indicate whether the arrived/responded and departed flags are currently in auto-detection mode or manual mode, if those flags are not set to true, when displaying the participation records for a traffic event in the open or open/closed traffic event list.	Participants	View Event Participants from Event List	prototype
SR4.3.5.13.3	The system shall allow a user with the Manage Traffic Event right to initiate the process of adding participants to a traffic event shown in the open or open/closed traffic event list if the event is of a type that supports participation.	Participants	View Event Participants from Event List	EventResourceOrTypeSelectionListForEvent.handleFormSubmission SD, EventResourceOrTypeSelectionListForEvent.addParticipationsToEvent SD, prototype
SR4.3.5.13.3.1	The system shall allow a user with the Manage Traffic Events right and viewing the open or open/closed traffic event list to perform a text search to find event resources and types to add to a traffic event, if the traffic event is of a type that supports participation.	Participants	View Event Participants from Event List	EventResourceOrTypeSelectionListSupporter.createDynList SD, prototype
SR4.3.6	View Event On Map		N/A	
SR4.3.6.1	The system shall allow a suitably privileged user to view traffic events on the map.		N/A	
SR4.3.6.1.6	[DELETED] The system shall display a different icon on the map for Action Events that have associated Traffic Signals to differentiate it from Action Events with no associated Traffic Signals.	Signal	N/A	N/A
SR4.3.6.1.7	The system shall display traffic signal icons on the map. (Used for managing traffic signal maintenance with Action Events).	Signal	View Traffic Signal On Map	Map CD, prototype
SR4.3.6.1.7.1	The system shall display traffic signal icons representing traffic signals associated with any open Action Event in the system on a map layer containing only those icons.	Signal	View Traffic Signal On Map	Map CD, MapReqHdlr.getSignalFeatureJSON SD
SR4.3.6.1.7.2	The system shall display traffic signal icons representing traffic signals not associated with any open Action	Signal	View Traffic Signal On Map	Map CD, MapReqHdlr.getAssociatedSignalFeatu

Tag	Requirement	Feature	Use Cases	Other Design Elements
	Event in the system on a map layer containing only those icons.			reOnlyJSON SD
SR4.3.6.1.7.2.1	Traffic Signal icons displayed on this map layer will only be displayed on the lowest 2 map zoom levels.	Signal	View Traffic Signal On Map	prototype only
SR4.3.6.1.7.3	The system shall display the name of the traffic signal when the user hovers the mouse cursor over a traffic signal icon in the map.	Signal	View Traffic Signal On Map	prototype only
SR4.3.6.1.7.4	The system shall allow the user to click on a traffic signal icon in the map to display summary information in a traffic signal map popup.	Signal	View Traffic Signal On Map	prototype only
SR4.3.6.1.7.4.1	The system shall display the name of the traffic signal in the traffic signal map popup.	Signal	View Traffic Signal On Map	prototype only
SR4.3.6.1.7.4.2	The system shall allow the user to click on a link in the traffic signal map popup to invoke the details page of any associated traffic events.	Signal	View Traffic Signal On Map	prototype only
SR4.3.6.1.7.4.3	The system shall display the AORs currently containing the geo location of the traffic signal in the traffic signal popup.	Signal	View Traffic Signal On Map	prototype only
SR4.3.7	View Priority Event List	Priority Event List	View Priority Event List	N/A (Header)
SR4.3.7.4	The priority event list shall display the following data for each traffic event: Event name (location is included in the name), time opened, controlling op center, duration, lanes closed, vehicles involved, queue, estimated time to clear, op center point of contact, on scene point of contact, names of participants that have arrived or responded, names of DMSs in the response plan of the traffic event, and comments. [CHANGED FOR LevA1077]	Priority Event List, Participants	View Priority Event List	Use Case Only
SR10	SYSTEM INTEGRATION		N/A	N/A (Heading)
SR10.16	The system shall integrate with the AVL GPS web service for the purpose of requesting AVL unit inventory and current geolocation data for CHART Event Resources.	Participants	Interface with AVL System	AVLDataManager.updateAVLData SD, AVLDataManager.updateAVLInventoryDataIfNecessary SD
SR10.16.1	The system shall pull AVL unit inventory data from the AVL GPS web service at a periodic interval.	Participants	Interface with AVL System	AVLDataManager.updateAVLInventoryDataIfNecessary SD

Tag	Requirement	Feature	Use Cases	Other Design Elements
SR10.16.1.1	The system shall allow a user with the Configure System right to specify the time interval at which the AVL unit inventory data is pulled.	Participants	Interface with AVL System	UserManagement CD
SR10.16.2	The system shall pull AVL unit geolocation data from the AVL GPS web service at a periodic interval.	Participants	Interface with AVL System	AVLDataManager.updateAVLData SD
SR10.16.2.1	The system shall allow a user with the Configure System right to specify a max age value for the system to use when pulling AVL unit geolocation data to limit values returned to include only recent geolocation data.	Participants	Interface with AVL System	UserManagement CD
SR10.16.2.2	The system shall allow a user with the Configure System right to specify the time interval at which the AVL geo location data is pulled.	Participants	Interface with AVL System	UserManagement CD

8 Use Case Diagrams

The use case diagrams depict new functionality for CHART R11 and also identify existing features that will be enhanced. The use case diagrams exist in the Enterprise Architect design tool in the chartdesign project, under the CHART folder.

8.1 Decision Support

8.1.1 Request Decision Support Suggestions

The system allows an operator to request suggested response plan actions for a traffic event through the use of the decision support sub-system. The decision support sub-system will generate suggested actions, as well as devices that are suggested to be revoked/removed from the response plan. The user may accept the suggested actions and add them to the response plan. The user may disable suggested actions either for the current request (temporarily) or for the life of the event (permanently). New for R11, the The decision support sub-system will suggest HAR messages. Also new for R11, a user may revoke/remove devices suggested to be revoked/removed from the response plan.

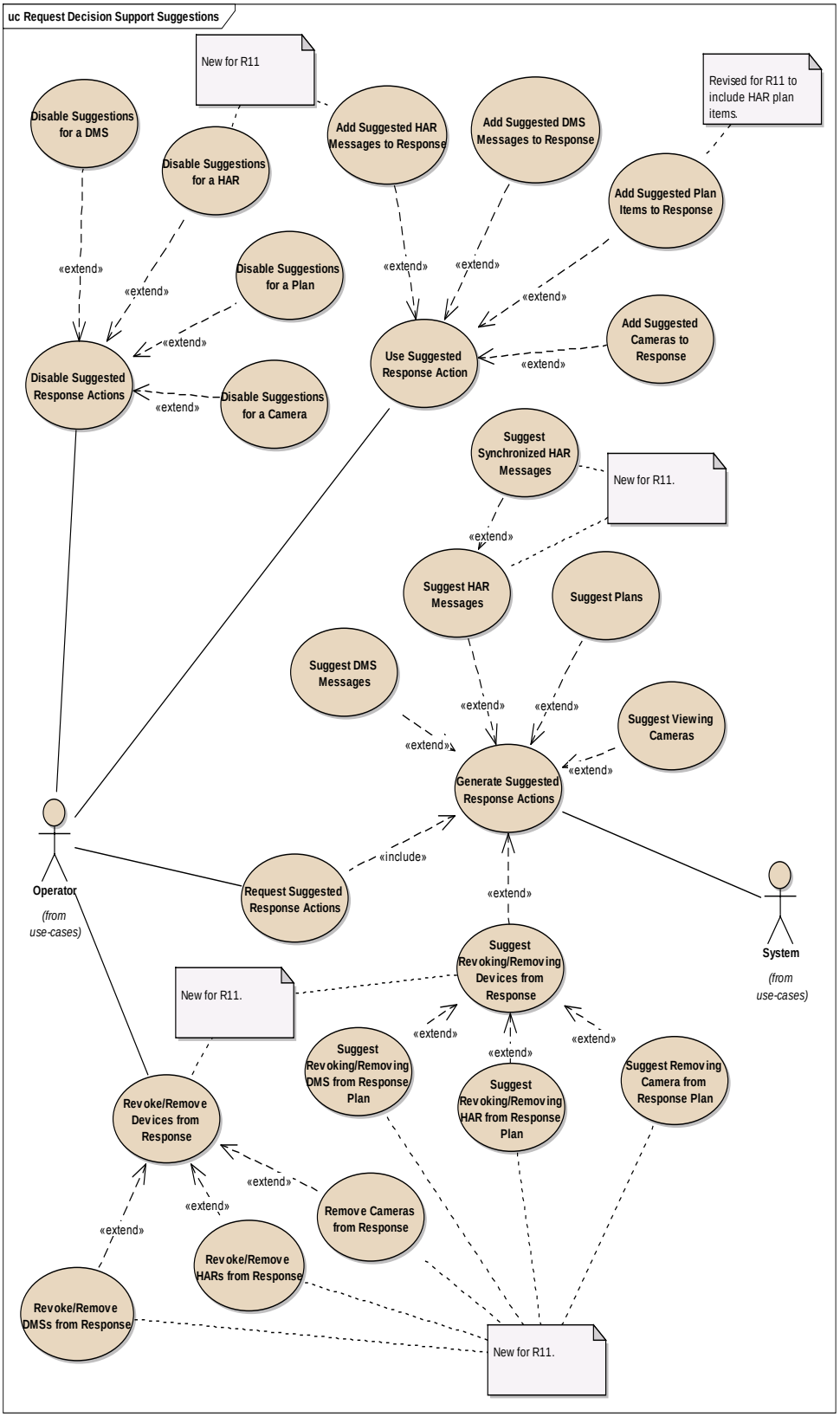


Figure 8-1. Request Decision Support Suggestions.

8.1.1.1 *Operator*

An operator is a user of the system who has been assigned a valid username/password combination and granted roles for system access.

8.1.1.2 *System*

The System actor represents any software component of the CHART system. It is used to model uses of the system which are either initiated by the system on an interval basis, or are an indirect by-product of another use case that another actor has initiated.

8.1.1.3 *<anonymous>*

New for R11.

8.1.1.4 *<anonymous>*

New for R11

8.1.1.5 *<anonymous>*

Revised for R11 to include HAR plan items.

8.1.1.6 *<anonymous>*

New for R11.

8.1.1.7 *<anonymous>*

New for R11.

8.1.1.8 *Add Suggested Cameras to Response*

A user with sufficient privileges may add one or more suggested cameras to the traffic event response plan video tour.

8.1.1.9 *Add Suggested DMS Messages to Response*

A user may add a suggested DMS message to the current response plan. If the device is already in the response plan, it will be updated to use the suggested message. The user may also activate the message immediately when adding it.

8.1.1.10 *Add Suggested HAR Messages to Response*

A user may add a suggested HAR message to the current response plan. If the device is already in the response plan, it will be updated to use the suggested message. The user may also activate the message immediately when adding it.

8.1.1.11 *Add Suggested Plan Items to Response*

A user may add one or more suggested DMS or HAR plan item messages to the current response plan. If the device is already in the response plan, it will be updated to use the suggested message. The user may also activate the message immediately when adding it.

8.1.1.12 *Disable Suggested Response Actions*

A user with sufficient privileges will be able to disable suggestions for a particular DMS, HAR, plan or camera (see extending use cases). The suggestions can be disabled for the life of the traffic event, or may be disabled only for the current response plan suggestions session. Once they are disabled, suggestions may also be re-enabled.

8.1.1.13 *Disable Suggestions for a Camera*

Suggestions may be disabled and re-enabled for a particular camera.

8.1.1.14 *Disable Suggestions for a DMS*

Suggestions may be disabled and re-enabled for a particular DMS.

8.1.1.15 *Disable Suggestions for a HAR*

Suggestions may be disabled and re-enabled for a particular HAR.

8.1.1.16 *Disable Suggestions for a Plan*

Suggestions may be disabled and re-enabled for a particular plan.

8.1.1.17 *Generate Suggested Response Actions*

In response to a request for suggested response actions from an Operator, the System will generate the suggested response actions for a traffic event. Refer to extending use cases to see what types of suggestions are supported.

8.1.1.18 *Remove Cameras from Response*

A user may remove cameras from the response plan of a traffic event that have been suggested to be revoked/removed from the response plan.

8.1.1.19 *Request Suggested Response Actions*

A user with sufficient privileges may request the suggested response actions for a traffic event.

8.1.1.20 *Revoke/Remove Devices from Response*

A user with sufficient privileges may revoke/remove devices from the response plan of a traffic event that have been suggested to be revoked/removed from the response plan.

8.1.1.21 *Revoke/Remove DMSs from Response*

A user may revoke/remove DMSs from the response plan of a traffic event that have been suggested to be revoked/removed from the response plan.

8.1.1.22 *Revoke/Remove HARs from Response*

A user may revoke/remove HARs from the response plan of a traffic event that have been suggested to be revoked/removed from the response plan.

8.1.1.23 *Suggest DMS Messages*

The system will suggest template based DMS messages for DMS devices that are eligible for decision support and are located within a configurable distance of the traffic event. Each device

can have multiple template based suggestions. Each template is tested to verify that it is suitable for the traffic event type, distance, proximity of the sign to the traffic event, and sign geometry. Each suitable template will result in a suggested message. All parameter tags in a suitable template will be replaced with values from the traffic event (including the distance to nearest exit and the lane closure description) to create the suggested message. Suggestions are scored according to their specificity of the DMS/Traffic Event combination. Thus, a template that pertains only to a traffic event of type Incident will be scored higher than a similar template that pertains to all traffic event types. Templates with higher scores are displayed to the user first. The system will also locate plans that contain the suggested DMS devices and will also suggest the planned messages for each of these devices. Because the system has no knowledge of the content of these messages they will be given the lowest possible score.

8.1.1.24 *Suggest HAR Messages*

The system will suggest template based HAR messages for HAR devices that are eligible for decision support and are located within a configurable distance of the traffic event. The distance will be determined based on the number of lanes closed (unless the traffic event does not have a lane configuration and then it will default to the maximum FAR distance). Each device can have multiple template based suggestions. Each template is tested to verify that it is suitable for the traffic event type, distance, and proximity of the HAR to the traffic event. Each suitable template will result in a suggested message. All parameter tags in a suitable template will be replaced with values from the traffic event (including the distance to nearest exit and the lane closure description) to create the suggested message. Suggestions are scored according to their specificity of the HAR/Traffic Event combination. Thus, a template that pertains only to a traffic event of type Incident will be scored higher than a similar template that pertains to all traffic event types. Templates with higher scores are displayed to the user first. The system will also locate plans that contain the suggested HAR devices and will also suggest the planned messages for each of these devices. Because the system has no knowledge of the content of these messages they will be given the lowest possible score.

8.1.1.25 *Suggest Plans*

The system will also suggest plans that contain either DMS devices or HAR devices that are within the configurable range of the traffic event. Each plan that contains any suggested devices will be suggested. Plans will be scored according to the percentage of total plan items that are either suggested DMS devices or suggested HAR devices and will be presented to the user in order of score.

8.1.1.26 *Suggest Removing Camera from Response Plan*

The System will suggest cameras that should be removed from the response plan.

8.1.1.27 *Suggest Revoking/Removing Devices from Response*

The System will suggested devices that should be revoked/removed from the response plan (based on their distance/proximity to the traffic event) because they are no longer suggested for this event.

8.1.1.28 *Suggest Revoking/Removing DMS from Response Plan*

The System will suggest DMSs that should be revoked/removed from the response plan.

8.1.1.29 *Suggest Revoking/Removing HAR from Response Plan*

The System will suggest HARs that should be revoked/removed from the response plan.

8.1.1.30 *Suggest Synchronized HAR Messages*

The system will suggest template based messages for a Synchronized HAR device if the Synchronized HAR and all of its constituent HARs are eligible for decision support. The system will suggest template based messages for a Synchronized HAR and all of its constituents if the Synchronized HAR or any of its constituents is within a configurable radius of the traffic event.

8.1.1.31 *Suggest Viewing Cameras*

The system will suggest cameras that are located within a configurable distance of the traffic event. Suggested cameras are scored according to their proximity to the traffic event. Cameras that are in the configured immediate proximity will be scored such that the closest devices are scored the highest without regard for route or direction of travel. Cameras that are in the near or far distance categories will be scored such that cameras that are upstream from the traffic event on the same route in the same direction of travel are scored higher than others regardless of distance from the event location.

8.1.1.32 *Use Suggested Response Action*

A user with sufficient privileges may use a suggested response action. Refer to the extending use cases to see the list of supported response actions the user may use.

8.1.2 Request Decision Support Suggestions Misc

The system allows an operator to request suggested device messages for DMSs and HARs in a traffic event response plan. The operator can request suggested messages for either all of the devices or devices with a blank message. The system allows an operator to request additional suggested response actions for a traffic event (when the system is indicating additional suggested response actions exist). The system allows an operator to view a preview of the response plan on a map. New for R11, an operator can request suggested device messages for HARs and HARs are included on the response plan preview map.

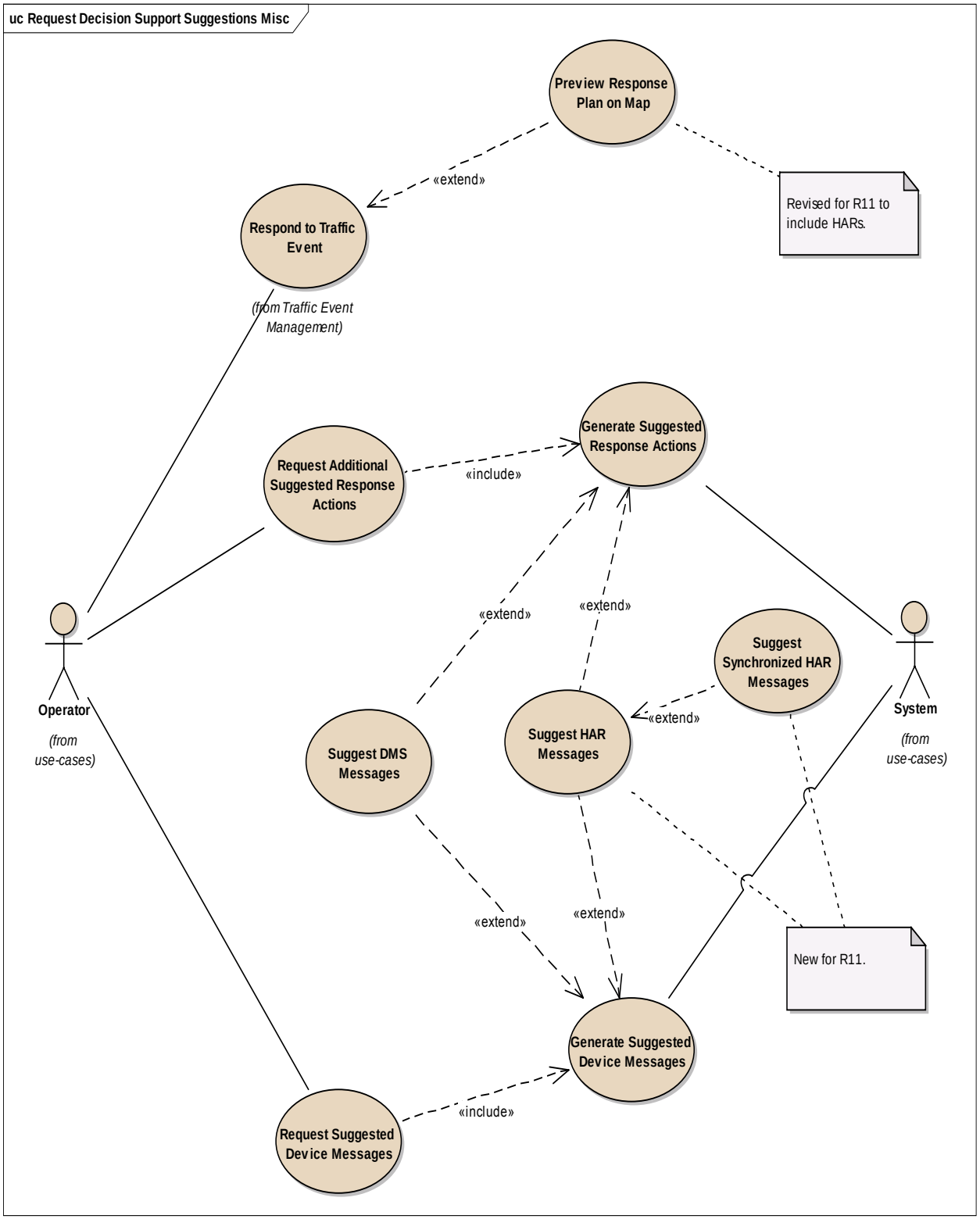


Figure 8-2. Request Decision Support Suggestions Misc.

1.1.1 Operator

An operator is a user of the system who has been assigned a valid username/password combination and granted roles for system access.

8.1.2.1 *System*

The System actor represents any software component of the CHART system. It is used to model uses of the system which are either initiated by the system on an interval basis, or are an indirect by-product of another use case that another actor has initiated.

8.1.2.2 *<anonymous>*

New for R11.

8.1.2.3 *<anonymous>*

Revised for R11 to include HARs.

8.1.2.4 *Generate Suggested Device Messages*

In response to a request from an Operator for message suggestions, the System will suggest messages for either all devices (i.e. DMSs and HARs) in the response plan or devices (i.e. DMSs and HARs) in the response plan with a blank message. The System will suggest messages for a device (i.e. a DMS or HAR) in the response plan even if that device (i.e. a DMS or HAR) was not originally suggested for this traffic event.

8.1.2.5 *Generate Suggested Response Actions*

In response to a request for suggested response actions from an Operator, the System will generate the suggested response actions for a traffic event. Refer to extending use cases to see what types of suggestions are supported.

8.1.2.6 *Preview Response Plan on Map*

A user may view a map that shows the traffic event, all currently planned response plan items, and any response plan items that should be considered. For each response plan item, the suggested message can be viewed by opening the device callout. DMS devices in the response plan that should not be considered will be highlighted on the map. Devices not in the response plan that should be considered will also be highlighted on the map. This will help the operator to visualize the future state of the system if the response plan is executed as currently planned.

8.1.2.7 *Request Additional Suggested Response Actions*

A user with sufficient privileges may request additional suggested response actions for a traffic event.

8.1.2.8 *Request Suggested Device Messages*

A user with sufficient privileges may request message suggestions for either all devices (i.e. DMSs and HARs) in the response plan or devices (i.e. DMSs and HARs) in the response plan with a blank message. The system will suggest messages for a device (i.e. a DMS or HAR) in the response plan even if that device (i.e. a DMS or HAR) was not originally suggested for this traffic event. The system will suggest messages for devices (i.e. a DMS or HAR) in the response plan that are decision support eligible.

8.1.2.9 *Suggest DMS Messages*

The system will suggest template based DMS messages for DMS devices that are eligible for decision support and are located within a configurable distance of the traffic event. Each device can have multiple template based suggestions. Each template is tested to verify that it is suitable for the traffic event type, distance, proximity of the sign to the traffic event, and sign geometry. Each suitable template will result in a suggested message. All parameter tags in a suitable template will be replaced with values from the traffic event (including the distance to nearest exit and the lane closure description) to create the suggested message. Suggestions are scored according to their specificity of the DMS/Traffic Event combination. Thus, a template that pertains only to a traffic event of type Incident will be scored higher than a similar template that pertains to all traffic event types. Templates with higher scores are displayed to the user first. The system will also locate plans that contain the suggested DMS devices and will also suggest the planned messages for each of these devices. Because the system has no knowledge of the content of these messages they will be given the lowest possible score.

8.1.2.10 *Suggest HAR Messages*

The system will suggest template based HAR messages for HAR devices that are eligible for decision support and are located within a configurable distance of the traffic event. Each device can have multiple template based suggestions. Each template is tested to verify that it is suitable for the traffic event type, distance, and proximity of the HAR to the traffic event. Each suitable template will result in a suggested message. All parameter tags in a suitable template will be replaced with values from the traffic event (including the distance to nearest exit and the lane closure description) to create the suggested message. Suggestions are scored according to their specificity of the HAR/Traffic Event combination. Thus, a template that pertains only to a traffic event of type Incident will be scored higher than a similar template that pertains to all traffic event types. Templates with higher scores are displayed to the user first. The system will also locate plans that contain the suggested HAR devices and will also suggest the planned messages for each of these devices. Because the system has no knowledge of the content of these messages they will be given the lowest possible score.

8.1.2.11 *Suggest Synchronized HAR Messages*

The system will suggest template based messages for a Synchronized HAR device if the Synchronized HAR and all of its constituent HARs are eligible for decision support. The system will suggest template based messages for a Synchronized HAR and all of its constituents if the Synchronized HAR or any of its constituents is within a configurable radius of the traffic event.

8.1.2.12 *Respond to Traffic Event*

The system allows an operator to control devices in response to an event through the use of a response plan. The user may add devices to the plan, select the desired state of the devices, then activate the plan. Any of the devices used by the event response plan may be deactivated while the event is open by removing the item for that device from the plan. When the event is closed, if the response plan is active, it will be deactivated automatically.

8.1.3 **Configure Decision Support General Settings**

The system allows an administrator to configure the decision support general settings that are used to generate suggested actions (both devices and messages) for a traffic event response plan. The administrator may configure distances, proximities, and route types. New for R11, an administrator can configure general decision support settings for HARs.

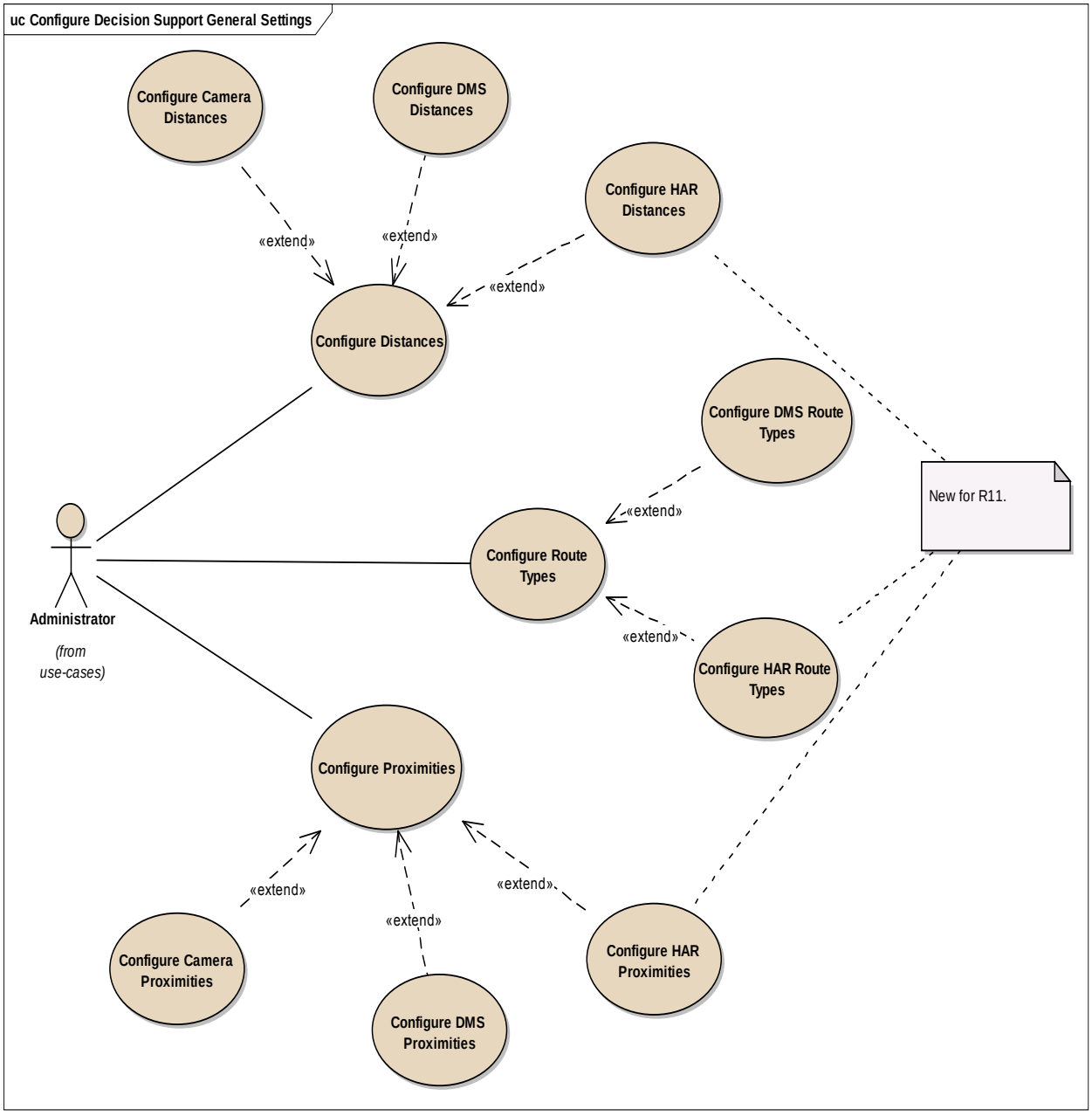


Figure 8-3. Configure Decision Support General Settings.

8.1.3.1 ***Administrator***

An administrator is a CHART user that has functional rights assigned to allow them to perform administrative tasks, such as system configuration and maintenance.

8.1.3.2 *<anonymous>*

New for R11.

8.1.3.3 *Configure Camera Distances*

A user may specify distance settings (maximum distance values and percentage of lanes closed) that are specific to camera devices.

8.1.3.4 *Configure Camera Proximities*

A user may specify proximity settings that are specific to camera devices.

8.1.3.5 *Configure Distances*

A user with sufficient privileges may configure the decision support distance settings. A user may configure the 3 maximum distances (in miles) - one for each of the 3 distance types: Immediate, Near, and Far. A user may configure a lane closure percentage for the Immediate and Near distance types. These settings are used to determine whether a device should be suggested for a traffic event.

8.1.3.6 *Configure DMS Distances*

A user may specify distance settings (maximum distance values and percentage of lanes closed) that are specific to DMS devices.

8.1.3.7 *Configure DMS Proximities*

A user may specify proximity settings that are specific to DMS devices.

8.1.3.8 *Configure DMS Route Types*

A user may specify route type settings (route type/number and route name) that are specific to DMS devices.

8.1.3.9 *Configure HAR Distances*

A user may specify distance settings (maximum distance values and percentage of lanes closed) that are specific to HAR devices.

8.1.3.10 *Configure HAR Proximities*

A user may specify proximity settings that are specific to HAR devices.

8.1.3.11 *Configure HAR Route Types*

A user may specify route type settings (route type/number and route name) that are specific to HAR devices.

8.1.3.12 *Configure Proximities*

A user with sufficient privileges may configure the decision support proximity settings. A user may configure the applicable proximities using the following 5 options: a) Same route, same direction, upstream; b) Same route, same direction, downstream; c) Same route, opposite direction, upstream; d) Same route, opposite direction, downstream; and e) Other route. These settings are used to determine whether a device should be suggested for a traffic event.

8.1.3.13 *Configure Route Types*

A user with sufficient privileges may configure the decision support route type settings. A user may configure the Route Type/Number and Route Name separately for each available route type. The route type settings will determine if a template will be suggested for a device based on whether a Route Type/Number tag or a Route Name tag exists in a device message template.

8.1.4 Configure Decision Support Message Templates

The system allows an administrator to configure the decision support message template settings that are used to generate suggested messages for a traffic event response plan. New for R11, an administrator can configure decision support templates for HARs.

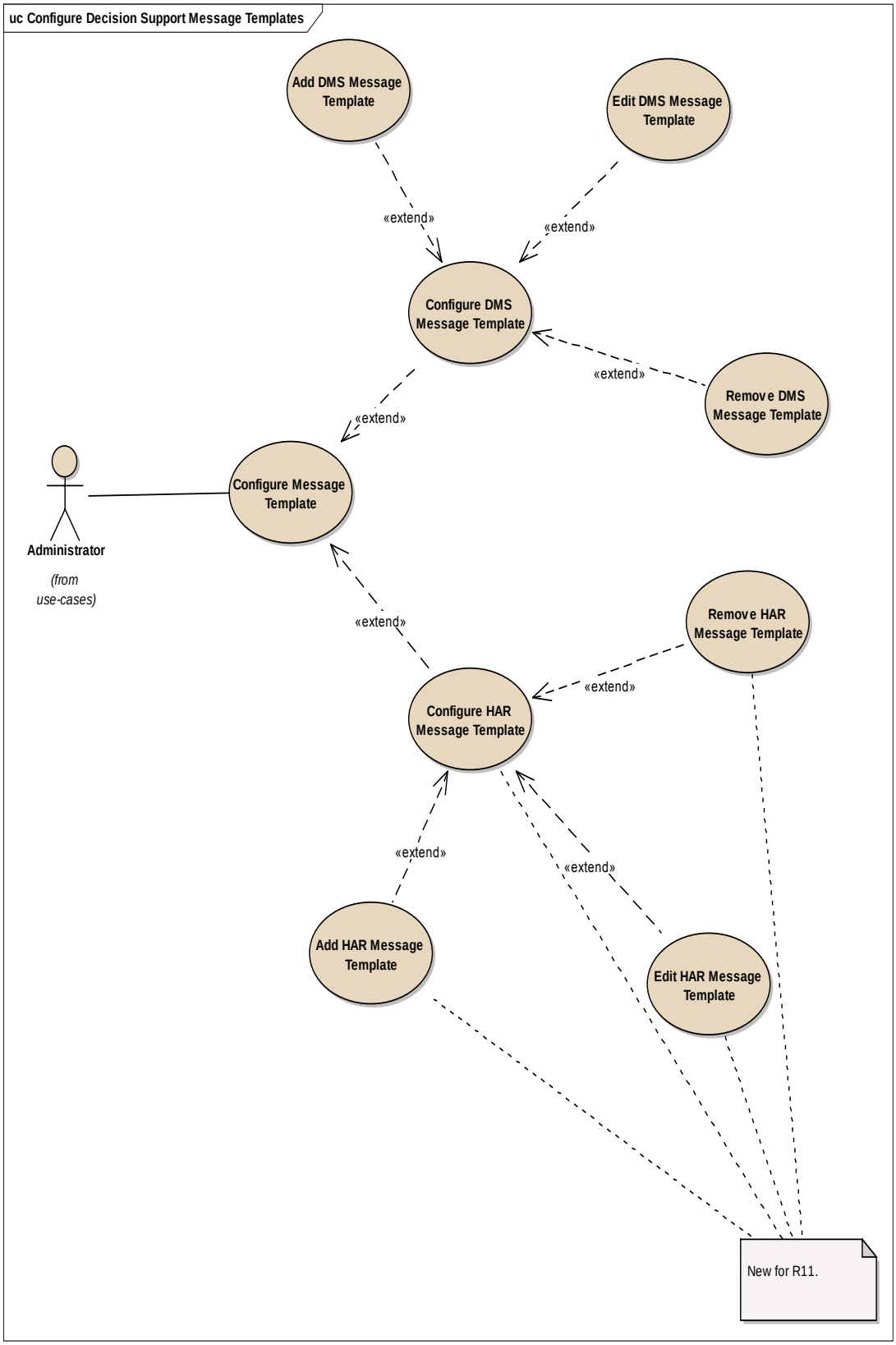


Figure 8-4. Configure Decision Support Message Templates.

8.1.4.1 *Administrator*

An administrator is a CHART user that has functional rights assigned to allow them to perform administrative tasks, such as system configuration and maintenance.

8.1.4.2 *<anonymous>*

New for R11.

8.1.4.3 *Add DMS Message Template*

A user with sufficient privileges may create a new DMS message template. The user must configure the message (consisting of static text and parameter tags), applicable traffic event types, applicable proximities, applicable distances, and maximum sign width. The possible parameter tags include: traffic event type, incident type, route type, route number, route name, route direction, proximity to nearest exit, intersecting exit number, intersecting exit route type, intersecting exit route number, intersecting exit road name, distance to nearest exit (in miles), and lane closures. The resulting message can contain up to 2 pages. The maximum width can be used to restrict the use of the template on larger signs, or it can be set without a maximum. The system will allow the user to view an image of the template using sample data on any of the applicable DMS Display Configurations defined in the system.

8.1.4.4 *Add HAR Message Template*

A user with sufficient privileges may create a new HAR message template. The user must configure the message (consisting of static text and parameter tags), applicable traffic event types, applicable proximities, and applicable distances. The possible parameter tags include: traffic event type, incident type, route type, route number, route name, route direction, proximity to nearest exit, intersecting exit number, intersecting exit route type, intersecting exit route number, intersecting exit road name, distance to nearest exit (in miles), and lane closures. The system will allow the user to view a text preview of the template using sample data.

8.1.4.5 *Configure DMS Message Template*

A user with sufficient privileges may configure DMS message templates. These templates are used to generate message suggestions for a DMS. Refer to the extending use cases for the details of what can be configured for a DMS message template.

8.1.4.6 *Configure HAR Message Template*

A user with sufficient privileges may configure HAR message templates. These templates are used to generate message suggestions for a HAR. Refer to the extending use cases for the details of what can be configured for a HAR message template.

8.1.4.7 *Configure Message Template*

A user with sufficient privileges may configure decision support message templates. These templates are used to generate decision support message suggestions. Refer to the extending use cases for the details of what can be configured for a message template.

8.1.4.8 *Edit DMS Message Template*

A user with sufficient privileges may edit an existing DMS message template. The user may edit the current values for the message, applicable traffic event types, applicable proximities, applicable distances, and maximum sign width.

8.1.4.9 *Edit HAR Message Template*

A user with sufficient privileges may edit an existing HAR message template. The user may edit the current values for the message, applicable traffic event types, applicable proximities, and applicable distances.

8.1.4.10 *Remove DMS Message Template*

A user with sufficient privileges may remove an existing DMS message template.

8.1.4.11 *Remove HAR Message Template*

A user with sufficient privileges may remove an existing HAR message template.

8.1.5 Configure Decision Support Word Substitutions

The system allows an administrator to configure the decision support word substitution settings that are used to generate suggested messages for a traffic event response plan. The administrator may configure word substitutions, lane closure word substitutions, traffic event and incident tag replacements, and route direction replacements. New for R11, an administrator can configure decision support word substitution settings that are specific to HARs.

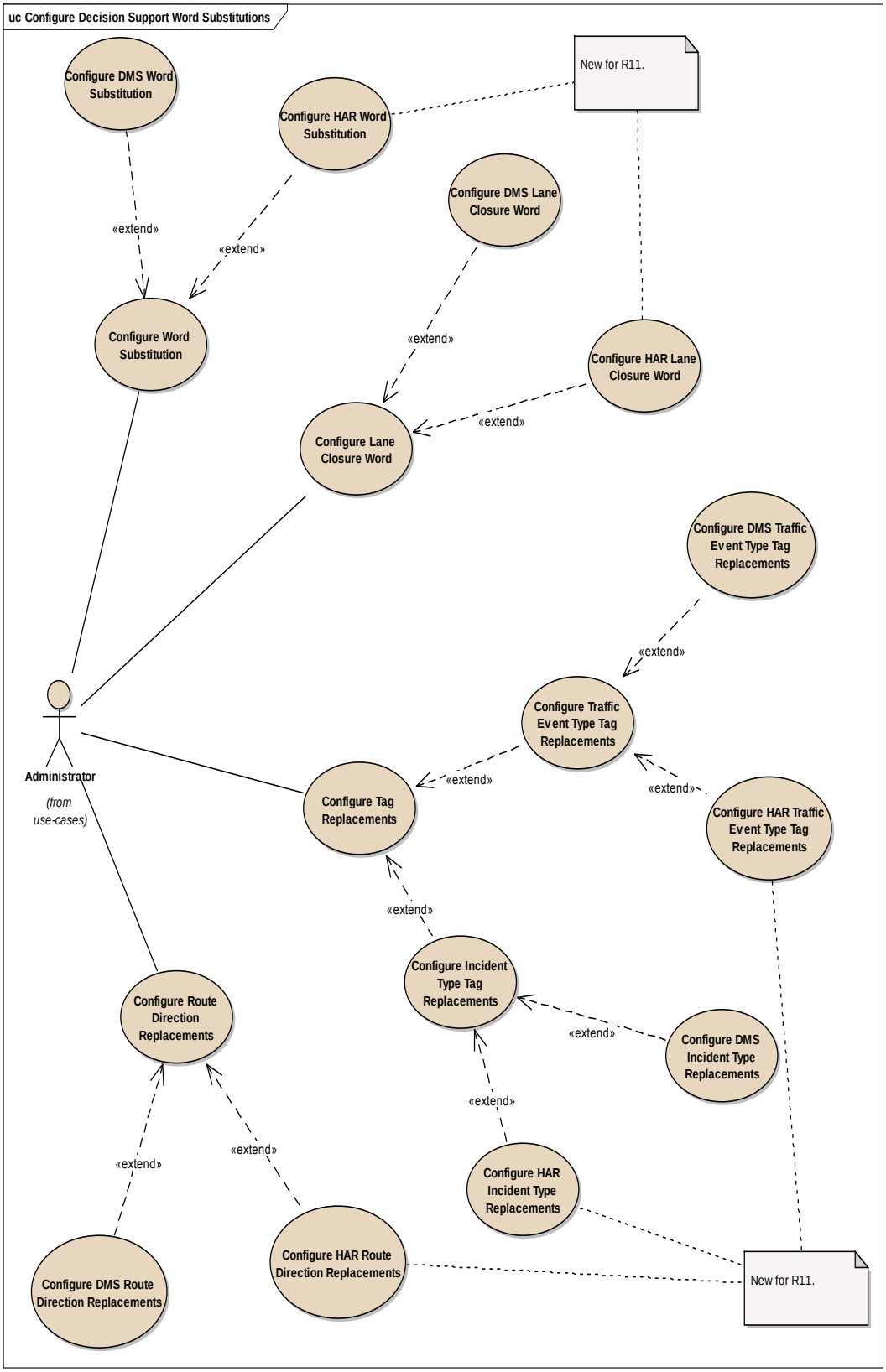


Figure 8-5. Configure Decision Support Word Substitutions.

8.1.5.1 *Administrator*

An administrator is a CHART user that has functional rights assigned to allow them to perform administrative tasks, such as system configuration and maintenance.

8.1.5.2 *<anonymous>*

New for R11.

8.1.5.3 *<anonymous>*

New for R11.

8.1.5.4 *Configure DMS Incident Type Replacements*

A user with sufficient privileges may configure the decision support DMS incident type tag replacement settings. Both a long and a short substitution can be configured for each incident type.

8.1.5.5 *Configure DMS Lane Closure Word*

A user with sufficient privileges may configure the decision support DMS lane closure word substitution settings. Both a long and a short substitution can be configured for each word.

8.1.5.6 *Configure DMS Route Direction Replacements*

A user with sufficient privileges may configure the decision support DMS route direction replacements settings. A user may specify a replacement for each route direction.

8.1.5.7 *Configure DMS Traffic Event Type Tag Replacements*

A user with sufficient privileges may configure the decision support DMS traffic event type tag replacement settings. Both a long and a short substitution can be configured for each traffic event type.

8.1.5.8 *Configure DMS Word Substitution*

A user with sufficient privileges may configure the decision support DMS word substitutions settings. Both a long and a short substitution can be configured for each word. It is valid for the user to enter blanks (not text) for the short version, the long version, or both. If both the long and short versions are blank, the word or phrase will be removed from the message completely.

8.1.5.9 *Configure HAR Incident Type Replacements*

A user with sufficient privileges may configure the decision support HAR incident type tag replacement settings. A replacement can be configured for each incident type.

8.1.5.10 *Configure HAR Lane Closure Word*

A user with sufficient privileges may configure the decision support HAR lane closure word substitution settings. A substitution can be configured for each word.

8.1.5.11 *Configure HAR Route Direction Replacements*

A user with sufficient privileges may configure the decision support HAR route direction replacements settings. A user may specify a replacement for each route direction.

8.1.5.12 *Configure HAR Traffic Event Type Tag Replacements*

A user with sufficient privileges may configure the decision support HAR traffic event type tag replacement settings. A replacement can be configured for each traffic event type.

8.1.5.13 *Configure HAR Word Substitution*

A user with sufficient privileges may configure the decision support HAR word substitutions settings. A substitution can be configured for each word. It is valid for the user to enter a blank (not text) for a substitution. If a substitution is blank, the word or phrase will be removed from the message completely.

8.1.5.14 *Configure Incident Type Tag Replacements*

A user with sufficient privileges may configure the decision support incident type tag replacement settings. The incident type replacements are used to replace incident type values from the traffic event that are replacing incident type tags in the message template. Refer to the extending use cases for the details of what can be configured.

8.1.5.15 *Configure Lane Closure Word*

A user with sufficient privileges may configure the decision support lane closure word substitution settings. These settings are used when replacing lane closure tag values in the message template. A substitution can be configured for each word. The lane closure word defaults to a value of "CLOSED" for Planned Roadway Closures and Special Events and a default value of "BLOCKED" for all other traffic event types. Refer to the extending use cases for the details of what can be configured.

8.1.5.16 *Configure Route Direction Replacements*

A user with sufficient privileges may configure the decision support route direction replacements settings. The replacements are used to replace directions from the traffic event that are replacing tags in the message template. A user may specify a blank replacement for a route direction to indicate that the route direction should not be used in message content. Refer to the extending use cases for the details of what can be configured.

8.1.5.17 *Configure Tag Replacements*

A user with sufficient privileges may configure the decision support tag replacement settings. These settings are used when replacing values from the traffic event that are replacing tags in the message template. Refer to the extending use cases for the details of what can be configured.

8.1.5.18 *Configure Traffic Event Type Tag Replacements*

A user with sufficient privileges may configure the decision support traffic event type tag replacement settings. The traffic event type replacements are used to replace traffic event type values from the traffic event that are replacing traffic event type tags in the message template. Refer to the extending use cases for the details of what can be configured.

8.1.5.19 *Configure Word Substitution*

A user with sufficient privileges may configure the decision support word substitutions settings. These settings are used when replacing tag values in the message template. The substitutions are not used to replace text entered by the user. Refer to the extending use cases for the details of what can be configured.

8.2 Device Management

8.2.1 Configure Devices

This use case diagram shows use cases related to device configurations. New for R11, DMSs and HARs can be configured to be decision support eligible.

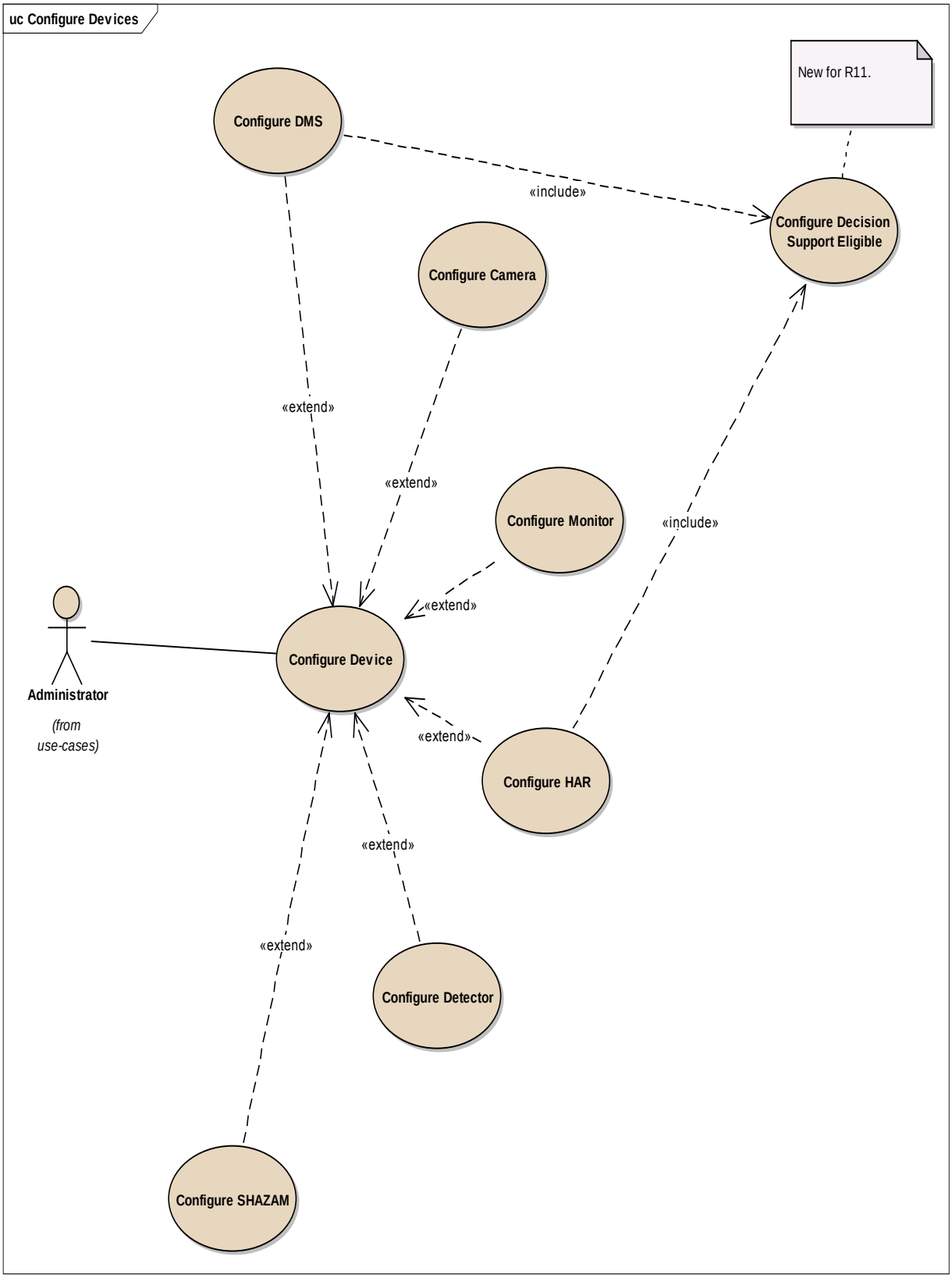


Figure 8-6. Configure Devices.

8.2.1.1 *Administrator*

An administrator is a CHART user that has functional rights assigned to allow them to perform administrative tasks, such as system configuration and maintenance.

8.2.1.2 *<anonymous>*

New for R11.

8.2.1.3 *Configure Camera*

The system shall allow a user with appropriate rights to configure the settings for a camera.

8.2.1.4 *Configure Decision Support Eligible*

The system shall allow a user with appropriate rights to configure the decision support eligible flag. Devices that are configured to be eligible for decision support can be suggested for a traffic event response plan.

8.2.1.5 *Configure Detector*

The system shall allow a user with appropriate rights to configure the settings for a detector (TSS), unless it is an external device.

8.2.1.6 *Configure Device*

The system shall allow a user with appropriate rights to configure a device.

8.2.1.7 *Configure DMS*

The system shall allow a user with appropriate rights to configure the settings for a DMS, unless it is an external DMS.

8.2.1.8 *Configure HAR*

The system shall allow a user with appropriate rights to configure the settings for a HAR.

8.2.1.9 *Configure Monitor*

The system shall allow a user with appropriate rights to configure the settings for a monitor.

8.2.1.10 *Configure SHAZAM*

The system shall allow a user with appropriate rights to configure the settings for a SHAZAM.

8.2.2 View Device Lists

This diagram shows use cases related to the operator viewing device lists. The operator can configure the specific columns displayed. New for R11, the device lists are filtered by the Operations Center filter (AORs and system folders) by default.

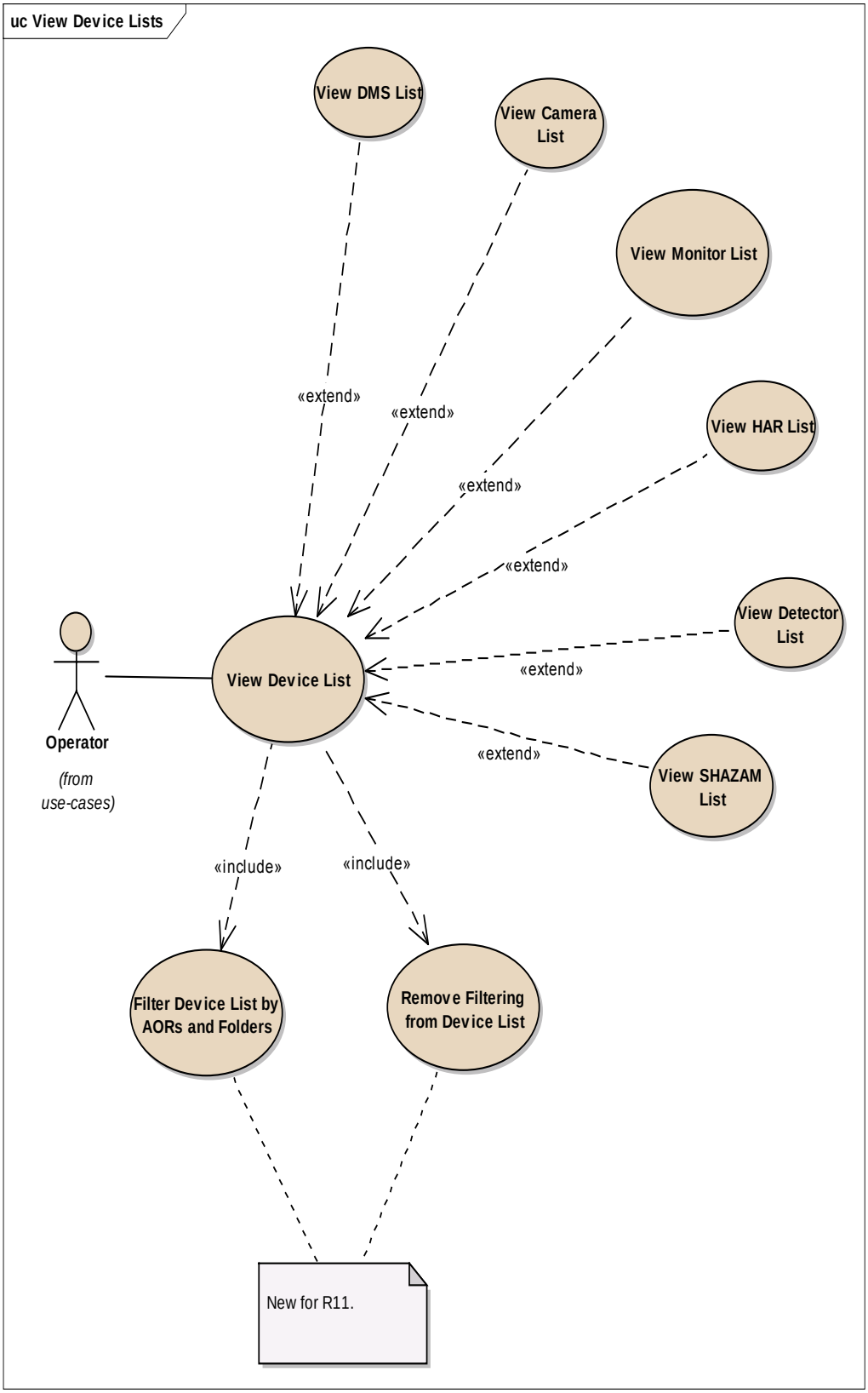


Figure 8-7. View Device Lists.

8.2.2.1 *Operator*

An operator is a user of the system who has been assigned a valid username/password combination and granted roles for system access.

8.2.2.2 *<anonymous>*

New for R11.

8.2.2.3 *Filter Device List by AORs and Folders*

The list of devices will initially be filtered to include only the devices contained in the area(s) of responsibility associated with the user's operations center (if any areas of responsibility are associated with the user's operations center) and the devices contained in the user's operations center's folders (if there are any DMSs in those folders). The list of devices will include all devices if no areas of responsibility are associated with the user's operations center and no DMSs are contained in the user's operations center's folders.

8.2.2.4 *Remove Filtering from Device List*

The area of responsibility and folders filter can be removed so that the list of devices will include all devices.

8.2.2.5 *View Camera List*

The system will allow a user with appropriate rights to view the list of cameras defined in the system. The columns displayed for the cameras include the Description/Location, Type, Actions, Region, Local Displays, Status, Owning Organization, Maintaining Organization, Controlled By, Route, Direction, County, Connection Site, State Mile Post, and Show on Map. In order to save screen space, the visible columns will be selectable, and several of the columns (Type, Owning Organization, Maintaining Organization, Connection Site, State Mile Post, and Show on Map) will be hidden by default. The user will be able to sort the camera list by any of the columns except the Actions column. The user will be able to filter the camera list by any of the columns except the Description/Location, Actions, and State MP columns.

8.2.2.6 *View Detector List*

The system will allow a user with appropriate rights to view the list of detectors (TSSs) defined in the system. The columns displayed for the detectors include the Description/Location, Model, Average Speed, Status, Last Update, Last BIT, Last BIT Fail, Scheduled BIT, Route, Direction, County, Port Managers, Connection Site, Owning Organization, Maintaining Organization, State Mile Post, and Show on Map. In order to save screen space, the visible columns will be selectable, and several of the columns (Model, Last Update, Last BIT, Last BIT Fail, Scheduled BIT, Port Managers, Connection Site, Owning Organization, Maintaining Organization, State Mile Post, and Show on Map) will be hidden by default. The user will be able to sort the detector list by any of the columns. The user will be able to filter the detectors list by any column except the Description/Location and State Mile Post columns. The system will allow the user to filter the list to include or exclude external detectors and/or internal (CHART) detectors (if the user has rights to view external detectors; otherwise, external detectors will be filtered out). If external detectors are displayed, the user will be able to filter the list by agency.

8.2.2.7 *View Device List*

A user may view the list of devices currently in the system.

8.2.2.8 *View DMS List*

The system will allow a user with appropriate rights to view the list of DMSs defined in the system. The columns displayed for the DMSs include the Description/Location, Model, Message, Beacons, Display Config, Status, Route, Direction, County, Used By, Port Managers, Connection Site, Overrides System TT Schedule, Owning Organization, Maintaining Organization, State Mile Post, and Show on Map. In order to save screen space, the visible columns are selectable, and several columns (Model, Display Config, Port Managers, Connection Site, Overrides System TT Schedule, Owning Organization, Maintaining Organization, State Mile Post, and Show on Map) are hidden by default. The user will be able to sort the DMS list by any of the columns. The user will be able to filter the DMS list by any of the columns except the Description/Location, and State MP columns. The system will allow the user to filter the list to include or exclude external DMSs and/or internal (CHART) DMSs if the user has rights to view external DMSs; otherwise, external DMSs will be filtered out. If external DMSs are displayed, the user will be able to filter the list by agency.

8.2.2.9 *View HAR List*

The system will allow a user with appropriate rights to view the list of HARs defined in the system. The columns displayed for the HARs include the The columns displayed for the Description/Location, Model, Message, Status, Active Notifiers, Used By, Route, Direction, County, Port Managers, Connection Site, Owning Organization, Maintaining Organization, State Mile Post, Frequency, Call Sign, and Show on Map. In order to save screen space, the visible columns will be selectable, and several columns (Model, Port Managers, Connection Site, Owning Organization, Maintaining Organization, State Mile Post, Frequency, Call Sign, and Show on Map) will be hidden by default. The user will be able to sort the HAR list by any of the columns. The user will be able to filter the HAR list by any of the columns except the Description/Location and State Mile Post columns.

8.2.2.10 *View Monitor List*

The system shall allow a user with the proper rights to view a list of monitors defined in the system. The columns displayed for the monitors include the Name, Actions, Group, Areas of Responsibility, Owning Organization, Maintaining Organization, Status, Current Display, Connection Site, and Auto Mode. In order to save screen space, the visible columns will be selectable, and several of the columns (Maintaining Organization, Connection Site, and Auto Mode) will be hidden by default. The user will be able to sort the monitor list by any of the columns except the Actions column. The user will be able to filter the monitor list by any of the columns except the Name and Actions columns.

8.2.2.11 *View SHAZAM List*

The system will allow a user with appropriate rights to view the list of SHAZAMs defined in the system. The columns displayed for the SHAZAMs will include the Description/Location, Model, Associated HAR, Beacon State, Status, Last Update, Route, Direction, County, Port Managers, Connection Site, Owning Organization, Maintaining Organization, State Mile Post, and Show on

Map. In order to save screen space, the visible columns will be selectable, and several of the columns (Model, Port Managers, Connection Site, Owning Organization, Maintaining Organization, State Mile Post, and Show on Map) will be hidden by default. The user will be able to sort the SHAZAM list by any of the columns. The user will be able to filter the SHAZAM list by any of the columns except Description/Location, Associated HAR, Last Update, and State Mile Post columns. The Port Managers column will only contain data for SHAZAMs set to use Telephony port communications.

8.3 Edit Object Locations

8.3.1 Edit Object Location

This use case diagram details what information will be used to specify a location for a traffic event or a device. Information will be provided by a GIS mapping database. Free form text will be allowed if the location is not in Maryland or is not easily described by the provided data. New for R11, the location aliases will be filtered by areas of responsibility.

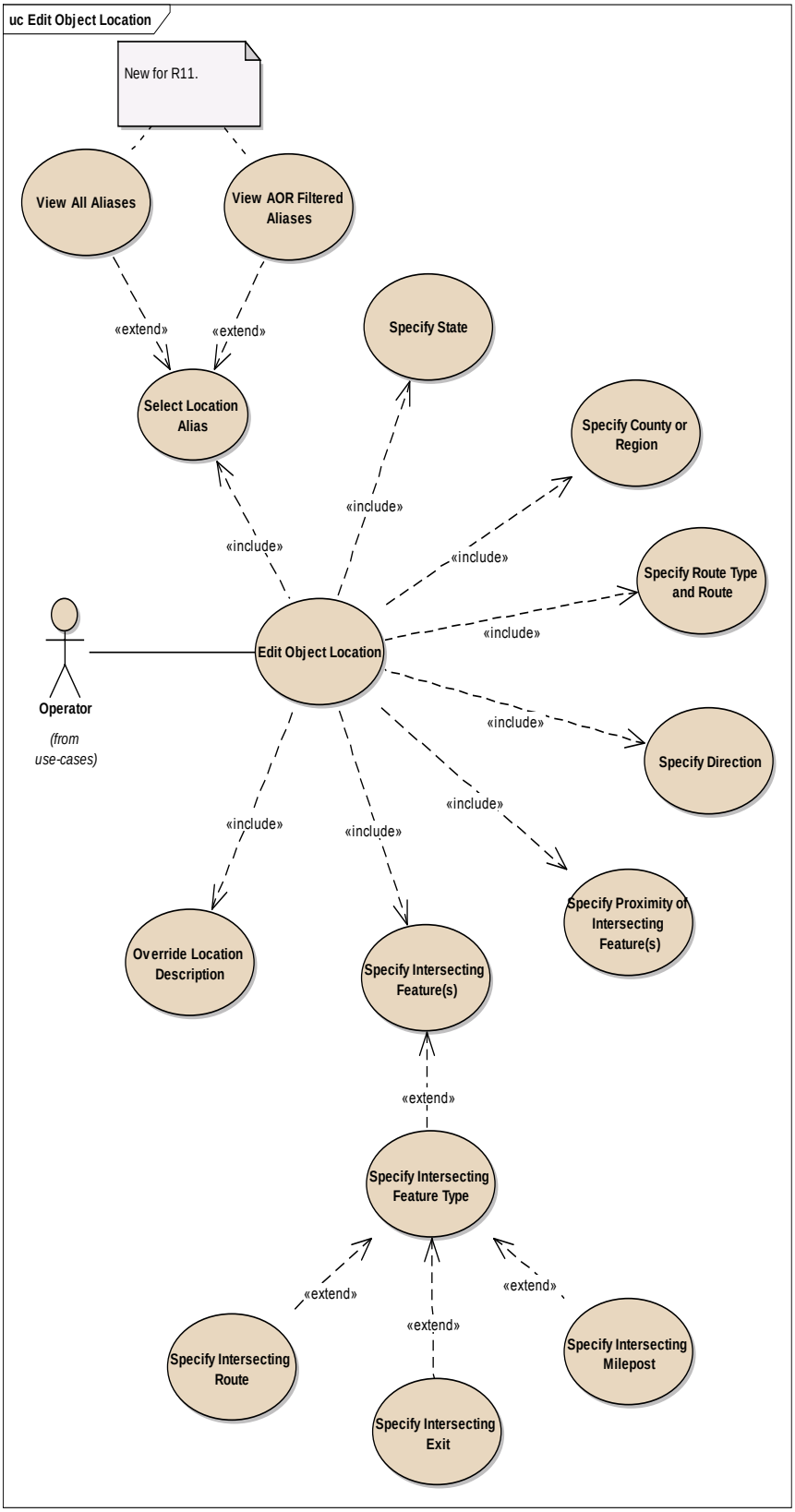


Figure 8-8. Edit Object Location.

8.3.1.1 *Operator*

An operator is a user of the system who has been assigned a valid username/password combination and granted roles for system access.

8.3.1.2 *<anonymous>*

New for R11.

8.3.1.3 *Edit Object Location*

The object location choices will be populated using data from the CHART Mapping application database. By default, MD will be selected as the state. If the selected state is MD, the user will be required to select a predefined MD county/region. If a route is specified, the user will first select a route type from a pick list ("I", "US", "MD", etc.) and the route type will be used to populate the list of predefined routes. To specify a route, the user will be required to select one of the predefined routes if the state is MD. If the state is not MD, the user will be able to enter a county name / region name and route number as freeform text. If a route number is specified, the user will be able to select intersecting roads by route number or route name, or specify the state or county milepost. Additionally the user will be able to specify whether the traffic event is at, prior, or past the intersecting feature ("at" will be selected by default). If the state is MD, the list of intersecting route numbers and names will be populated for the user as suggestions; however, the user can still specify freeform text for an intersecting route number, route name, county milepost, and state milepost even if the state is MD.

8.3.1.4 *Override Location Description*

The user may specify free form text for the location description field to override the object location description generated by the GUI from the input fields. The GUI will warn the user twice before allowing an overridden location description to be used.

8.3.1.5 *Select Location Alias*

The user will be able to specify a location by a predefined alias. For example, FMT will describe the Fort McHenry Tunnel.

8.3.1.6 *Specify County or Region*

The user will select from a drop down list the name of a county or region based on what state is selected. The user will be allowed to enter free form text if the state is not Maryland.

8.3.1.7 *Specify Direction*

The user will select from a drop down list the direction (North, East, South, West, etc.) of the object. The direction will default to None.

8.3.1.8 *Specify Intersecting Exit*

The user will be able to specify the intersecting exit number, if a main route was specified. The list of intersecting exit numbers will be populated for MD, and the user may select one of the

predefined route numbers in this case. The user is not required to select one of a predefined exits and can enter freeform text for MD or any other state.

8.3.1.9 *Specify Intersecting Feature(s)*

The user will specify any intersecting features by type (Route, Exit, or Milepost). None, one, or two intersecting features may be specified.

8.3.1.10 *Specify Intersecting Feature Type*

The user will select from a drop down list the type (Route, Exit, or Milepost) of the intersecting feature.

8.3.1.11 *Specify Intersecting Milepost*

The user will be able to enter either a State or County milepost number to specify the location of a traffic event along the roadway.

8.3.1.12 *Specify Intersecting Route*

The user will be able to specify the intersecting route number, if a main route was specified. The list of intersecting route numbers will be populated for MD, and the user may select one of the predefined route numbers in this case. The user will also be able to specify the intersecting route by name, if a main route was specified. The list of intersecting route name will be populated for MD, and the user may select one of the predefined routes in this case. The user is not required to select a predefined route number or name and can enter freeform text for MD or any other state.

8.3.1.13 *Specify Proximity of Intersecting Feature(s)*

The user will select from a drop down list the proximity (AT, PAST, PRIOR TO, etc.) of any intersecting features. The proximity will default to AT.

8.3.1.14 *Specify Route Type and Route*

The user will be able to specify the route type and route a traffic event is on. To specify a route, the user will first select the state, county, and route type. The route types will be shown in a pick list ("I", "US", "MD", etc.). If route information is available for the specified state, county, and route type, the routes pick list will be populated. To specify a route the user will be required to select one of the predefined routes if the state is MD. If the state is not MD, the user will be able to enter a route number as freeform text.

8.3.1.15 *Specify State*

The user will select from a drop down list the abbreviation of the state. The state will default to MD.

8.3.1.16 *View All Aliases*

The user will be able to view all predefined location aliases in the system.

8.3.1.17 *View AOR Filtered Aliases*

The user will be able to view all predefined location aliases in the system that are located within an area of responsibility that is associated with the user's operations center. The list of location

aliases will include all location aliases if no areas of responsibility are associated with the user's operations center.

8.4 Event Resource Management

8.4.1 Event Resource Management

This diagram shows use cases related to managing event resource types and event resources, which are candidates for use as participants in traffic events.

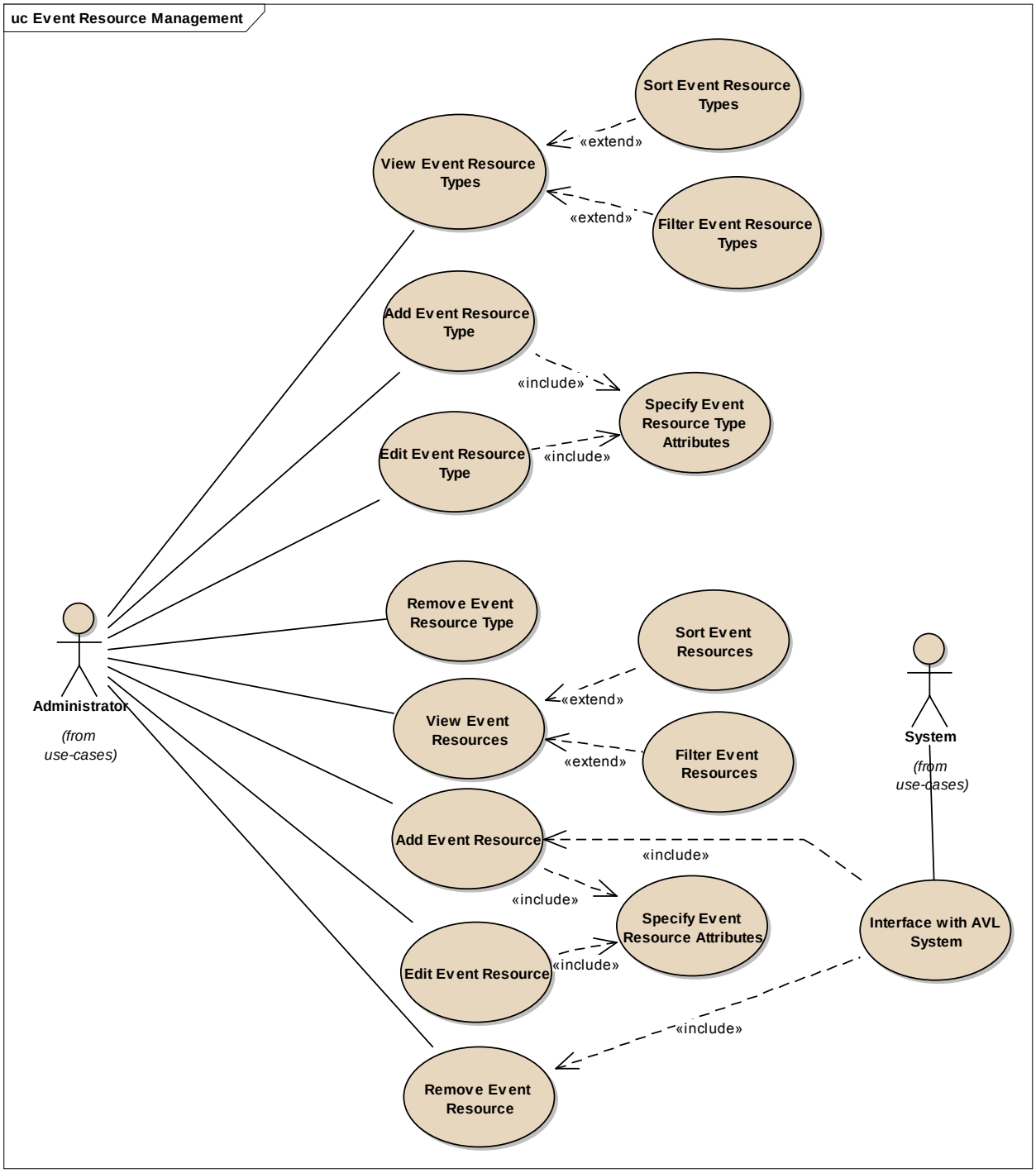


Figure 8-9 Event Resource Management

8.4.1.1 **Add Event Resource**

An administrator with the Manage Event Resources right can add a new event resource to the system.

8.4.1.2 Add Event Resource Type

An administrator with the Manage Event Resources right can add a new event resource type to the system.

8.4.1.3 Edit Event Resource

An administrator with the Manage Event Resources right can edit an existing event resource.

8.4.1.4 Edit Event Resource Type

An administrator with the Manage Event Resources right can edit an existing event resource type.

8.4.1.5 Filter Event Resource Types

The user can filter the list of resource types by Category, Unit Name Support, AVL Support, In Service Support, and/or Camera Support. Filters can be combined and filters can be removed individually. The user can remove all filters to view all resource types.

8.4.1.6 Filter Event Resources

The event resource list can be filtered by type, category, unit name support, AVL support, in service support, in service status, camera support, and associated camera flag (has associated camera). The user can combine filters, remove individual filters, or remove all filters to view all. Event resources that have been added to the system automatically will be filtered out by default, but the user can choose to view these resources.

8.4.1.7 Interface with AVL System

The system will integrate with the AVL system to periodically pull an inventory of AVL vehicles and to periodically update the location data for those vehicles. The polling rate for both of these activities is configurable. Additionally, a configurable max age setting will be used to ensure only recent location data is retrieved.

This AVL data will be used for a number of purposes:

- Associate with event resources to allow their locations to be viewed on a map, be seen in textual form on various web pages, and to see their distance from the location of traffic events.
- To detect when an event resource is on-scene or has departed the scene of a traffic event (See Detect Event Resource On Scene and Detect Event Resource Departed Scene).
- To automatically add (or remove) unnamed event resources for event resource types that are configured to support AVL with automatic configuration enabled.

8.4.1.8 Remove Event Resource

An administrator with the Manage Event Resources right can remove an existing event resource. If that resource is currently in use by any traffic event in the system, the resource will be marked for later removal.

8.4.1.9 **Remove Event Resource Type**

The system will allow an administrator with the Manage Event Resources right to remove an existing event resource type if there are no event resources in the system of that type. If the resource type is currently in use by any traffic event in the system, the resource type will be marked for later removal.

8.4.1.10 **Sort Event Resource Types**

The user can sort the list of event resource types by name, category, unit name support, AVL support, in service support, or camera support.

8.4.1.11 **Sort Event Resources**

The user can sort the list of event resources by resource description, type, category, unit name support, unit name, AVL support, AVL vehicle ID, in service support, in service status, camera support, and associated camera.

8.4.1.12 **Specify Event Resource Attributes**

The following attributes can be specified for an event resource:

- Event Resource Type (required)
- Unit Name (if applicable)
- AVL Vehicle ID (if applicable)
- Associated Camera (if applicable)
- Associated Op Centers (optional) - Specifies the op centers where this event resource will be made available for use as a participant in a traffic event. Allows "all" to be specified to indicate it is to be available to all op centers, current and future.

Applicability of attributes is determined by the selected event resource type by default, however the user can override the applicability settings in the type for a specific event resource.

8.4.1.13 **Specify Event Resource Type Attributes**

The following attributes can be specified for each event resource type:

- Name (required)
- Category (required)
- Unit Name Support (required), specifies if a unit name is required, optional, or not included for resources of this type by default.
- AVL Support (required), specifies if AVL support is required, optional, or not included for resources of this type by default.
- Automatic Resource Configuration (optional) - available if the type does not require unit name support and does support AVL. Specifies that the system is to automatically detect resources of this type based on a text string (required) included in the AVL data, and automatically add event resources to the system provided the system does not already have an event resource with the same AVL device ID. Automatically added resources will not have a unit name, and will be added for all operations centers. When this feature is enabled, it will also cause the system to detect when a previous automatically added event resource no longer exists in the AVL data for a configurable amount of time, and automatically remove it from the system if it is not currently in use by any traffic events.

- Show Type Name Only When Adding to Traffic Event (optional) - specifies that if event resources of this type exist that don't have a unit name, only the type name should be shown when adding participants to a traffic event and the individual un-named resources of this type should not be shown.
- Camera Support (optional)- specifies if resources of this type support being associated with a camera, by default.
- In Service (optional) - specifies if resources of this type support being marked as in service or out of service, by default.
- Icons - One or more icons must be specified if the type supports AVL, depending on other settings for the type. If the event resource type does not support in service / out of service, a single icon must be specified to represent event resources of this type. Otherwise, if the type does not support camera association, two icons are required, one for in service and one for out of service. If camera association is supported, a third icon is required, for in service with an associated camera.
- Operations Center Associations (optional) - specifies the operations centers where this event resource type should be included for use in adding the type as an event participant, if any. A value of "all" is supported to indicate the type should be included for use by all existing and future op centers.

8.4.1.14 **View Event Resource Types**

An administrator with the Manage Event Resources right can view the event resource types that have been previously added to the system. For each event resource type, the following information shall be available: Name, Category, Unit Name Support, AVL Support, In Service Support, Camera Support, and the number of resources of that type currently defined in the system. An action column is also displayed for each event resource type, with appropriate actions that can be performed on the event resource type. The user can show or hide columns in the event resource type list, except for the Name and Actions column which are always visible. By default, all columns are shown. If the user is viewing other than the default columns, they can choose to view the default columns.

8.4.1.15 **View Event Resources**

The system will allow an administrator with the Manage Event Resources right to view the list of event resources defined in the system. The following information will be available for each resource: description, type, category, unit name support, unit name, AVL support, AVL vehicle ID, in service support, in service status, camera support, and associated camera. The user can choose which columns to show while viewing the list of event resources.

8.5 Home Page and Op Center Report

8.5.1 **Home Page Use Cases**

This diagram shows use cases related to the home page, which is shown when the user logs into the system.

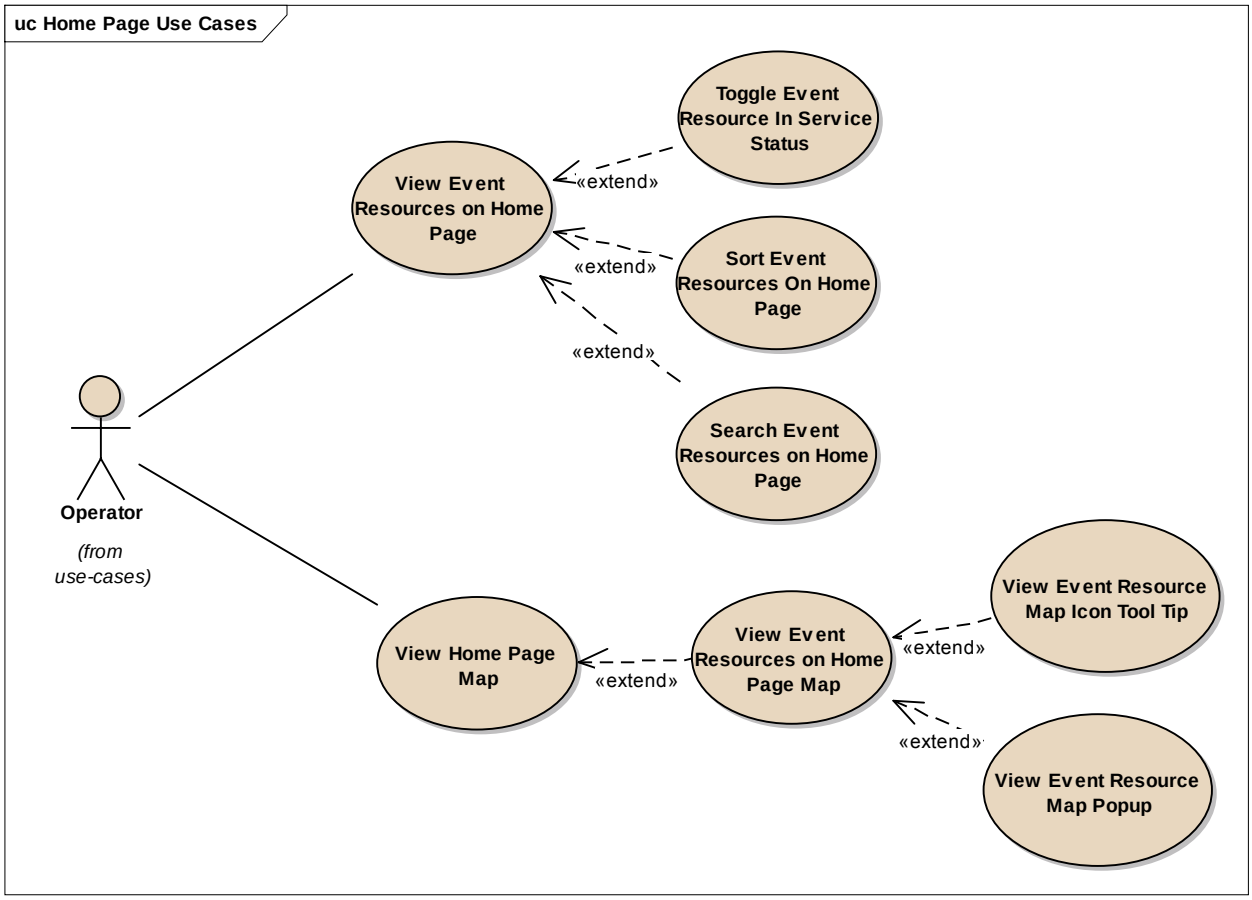


Figure 8-10 Home Page Use Cases

8.5.1.1 Search Event Resources on Home Page

The user can enter search text to find a field unit or facility within their respective lists on the home page.

8.5.1.2 Sort Event Resources On Home Page

The user can sort the list of field units and facilities shown on the home page. Both field units and facilities can be sorted by the in service / out of service status, type, and unit name. Field units can also be sorted by location and AVL status.

8.5.1.3 Toggle Event Resource In Service Status

A user with the Basic Operations right can toggle the in service / out of service status for an event resource shown on their home page. When this occurs, the system will automatically make an entry in the communications log to record the status change.

8.5.1.4 View Event Resource Map Icon Tool Tip

The user can drag their mouse over an event resource icon shown on the map to view a tool tip that shows the event resource type and unit name (if any). If a unit name is not available, the ID of the AVL device will be shown. If map icons are overlapping, the tool tip will be a select list

that shows the tool tips for all overlapping icons and allows selection to view a pop up for any of them.

8.5.1.5 View Event Resource Map Popup

The user can click on an event resource icon on the map (or on the event resource in the select list shown in the tool tip for overlapping icons) to see a subset of information about the event resource. The popup will include the following information:

- Event resource type
- Event resource unit name (or AVL device ID if no unit name)
- In Service / Out of Service status, if applicable
- Text location, if available
- Heading, if available
- Speed, if available
- AVL data timestamp
- Name of associated camera, if any
- Names of traffic events to which the event resource is assigned, if any. For each traffic event, an indicator will be used to show if the resource is on the scene of the event (it is marked as arrived/responded and not marked as departed).

Navigation will be provided to allow the user to view the camera details page for the associated camera (if any), view the form used to display the associated camera (if any) on a monitor, and view the associated camera (if any) on the desktop (if desktop video is enabled for the camera and user's op center). Navigation will also be provided to the details page for any traffic event shown.

8.5.1.6 View Event Resources on Home Page

A user can view all event resources assigned to their logged in center that support in service / out of service status on their home page. The system will display the resources in two separate lists; field units and facilities. The system will consider any resource that supports in service / out of service and supports AVL as a field unit. The system will consider any resource that supports in service and out of service but does not support AVL as a facility. The following information will be shown for all resources: in service indicator, type, name, and list of traffic events for which the resource is a participant. In the list of traffic events, an indicator will be used to identify those events where the event resource is currently on scene (marked as arrived/responded but not marked as departed). For field units, the current location (if known) and the AVL status will be shown. Navigation will be provided for each traffic event listed that allows the user to view the event details page in the working window. Navigation will also be provided for resources with active AVL to allow the user to view the location of the resource on the home page map.

8.5.1.7 View Event Resources on Home Page Map

When zoomed into a configurable level of the home page map, the user can enable map layers that show the locations of AVL enabled event resources with active associated AVL devices. A main layer exists for Event Resources with all child layers visible by default if the main layer is made visible. A child layer will exist for each event resource type defined in the system that allows or requires AVL support, or that has any individual resources that have an associated

AVL device. The icon shown to represent an event resource's location will be as specified for the event resource type, depending on the in service / out of service status of the resource and whether or not a camera is associated.

8.5.1.8 View Home Page Map

The system provides a geographic map that allows users to view the locations of various CHART related objects.

8.5.2 Op Center Report Use Cases

This diagram shows use cases related to the op center report, which is shown to the user in their details page when they log in, or when they request to view it at other times.

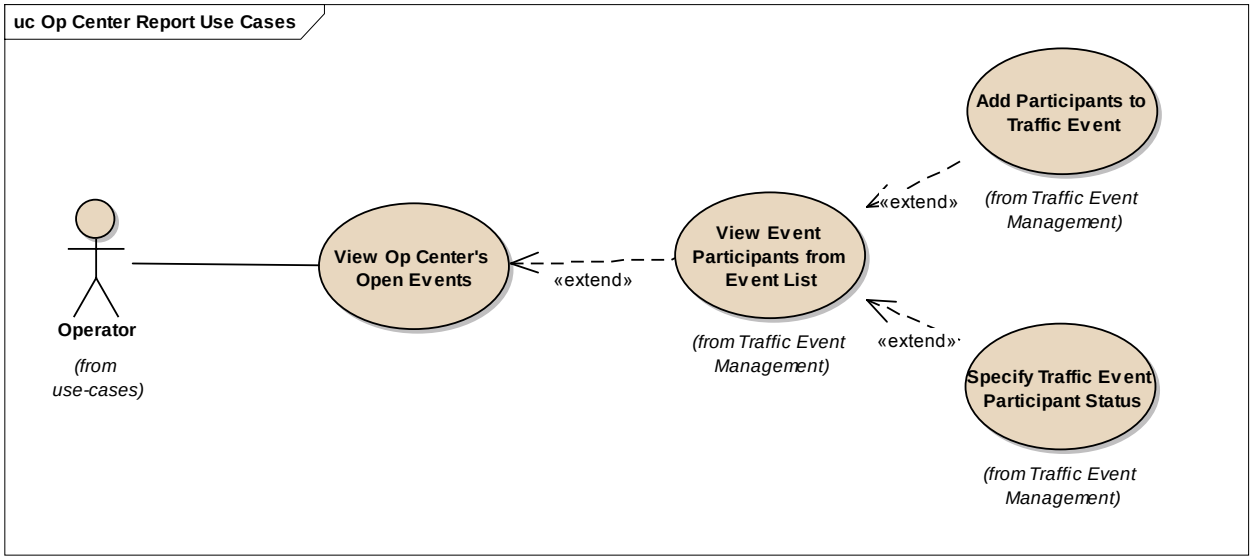


Figure 8-11 Op Center Report Use Cases

8.5.2.1 View Op Center's Open Events

The user can view the open traffic events controlled by their center on their op center report.

8.6 Notification Management

8.6.1 Notification Management Use Cases

This diagram shows use cases related to sending notifications and configuring the short cuts and abbreviations that assist the user in constructing a notification message.

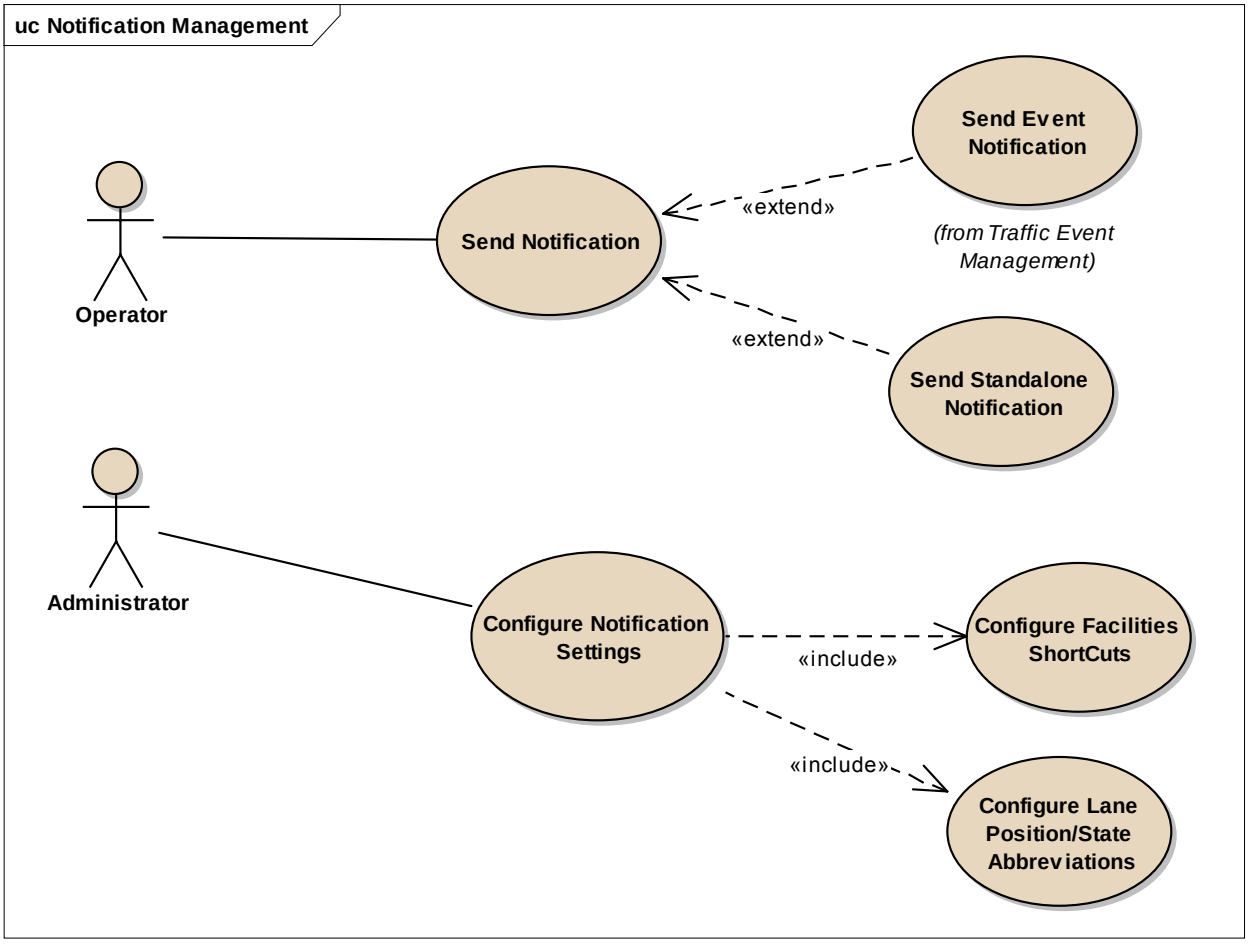


Figure 8-12 Notification Management Use Cases

8.6.1.1 Configure Facilities ShortCuts

A user with the configure system right can configure facilities short cuts, to appear on the send notification form when it is used within the context of a traffic event. Facilities such as the ICC and FMT can be added to the list of facilities short cuts and can then be used when sending a traffic event notification to quickly insert the name of the facility to which the traffic event applies.

8.6.1.2 Configure Lane Position/State Abbreviations

The system shall allow an administrator the ability to define abbreviations for lane position and state values. Functionality is added in R11 to define abbreviations for lane states of all lanes open or all lanes closed.

8.6.1.3 Configure Notification Settings

The system shall allow an administrator with the configure system profile right the ability to configure notification related properties. Notification properties include quick links, miscellaneous shortcuts, abbreviations for various object types, and facilities shortcuts.

8.6.1.4 Send Event Notification

The system shall allow a user with the send notification right to send e-mail notifications pertaining to the traffic event. Various short cuts will be provided to assist the user in creating the message content. A suggestion feature will suggest the content of the message based on data from the traffic event.

8.6.1.5 Send Notification

The system shall allow an operator with the right to send notifications the ability to send standalone notifications or notifications from within the context of a traffic event. The sender must include their initials to send a notification.

8.6.1.6 Send Standalone Notification

The system shall allow a user with the send notification right to send a notification outside the context of a traffic event.

8.7 Operations Center Management

8.7.1 Manage Op Center Event Resources

This diagram shows use cases related to the management of event resources (and types) associated with an operations center. Event resources and event resource types associated with an operations center will be available for use as traffic event participants for any traffic events controlled by the center and all traffic events managed by users logged into the center.

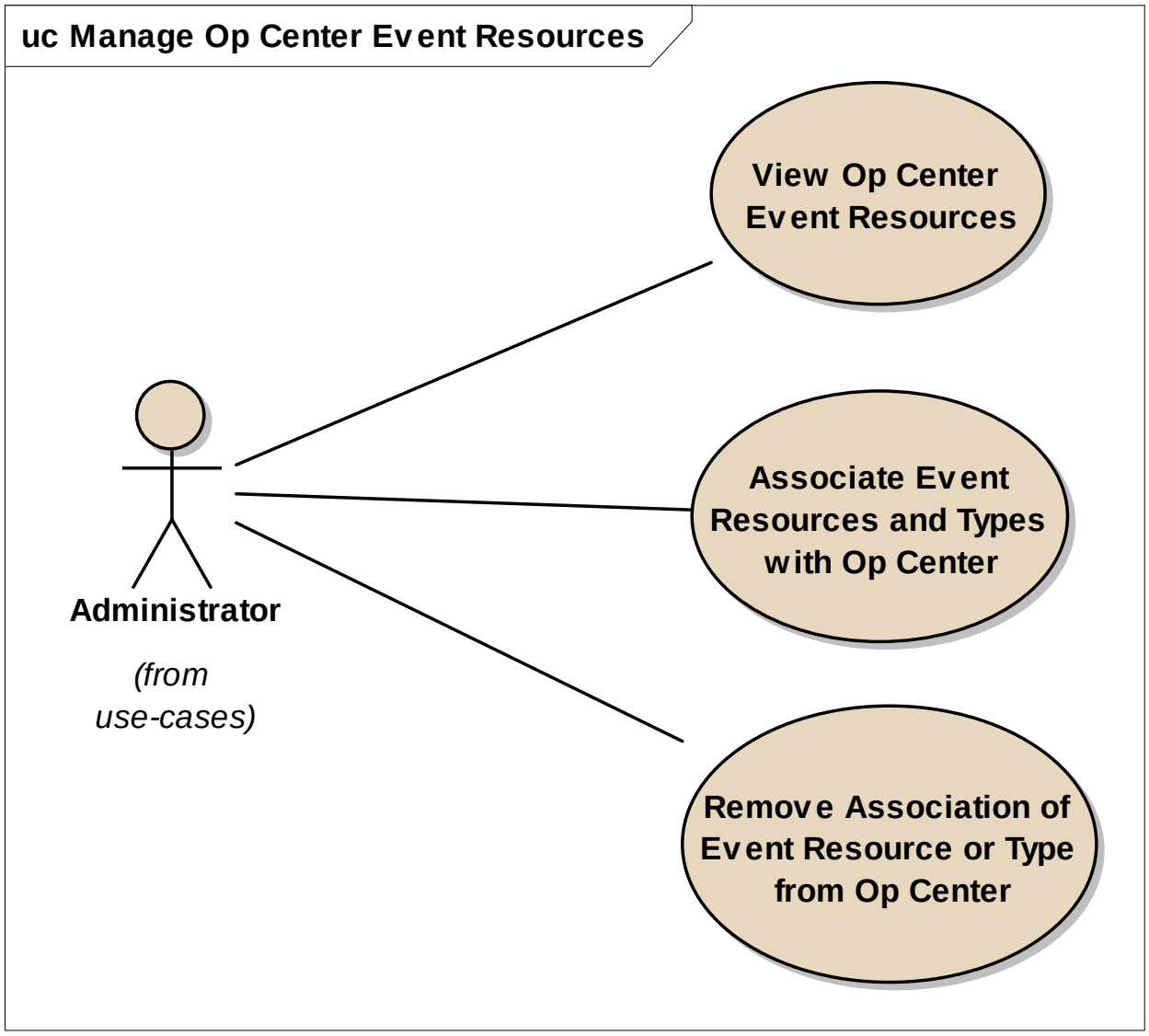


Figure 8-13 Manage Op Center Event Resources

8.7.1.1 Associate Event Resources and Types with Op Center

An administrator with the right to manage op centers can add an event resource (or type) to the list of event resources associated with an operations center. The system will be configured to include at least the following categories of event resources: Agency, CHART Unit, Facility, Resource, Special Needs. When the user chooses to add an association, the system will display a list of event resources (and types) that have not already been associated with the op center. This list will show the following information for each event resource / event resource type as applicable: description, type, category, unit name, AVL vehicle. The list will allow sorting by description, type, category, unit name, and AVL vehicle. The list will allow filtering by type and category.

8.7.1.2 **Remove Association of Event Resource or Type from Op Center**

An administrator with the right to manage op centers can remove an event resource or event resource type that has been previously associated with an operations center. Note that if an event resource or type is set to be associated with all centers, the association cannot be removed. Instead, the user must edit the event resource or type to remove the "all centers" flag.

8.7.1.3 **View Op Center Event Resources**

An administrator with the right to manage operations centers can view the list of event resources (and event resource types) that have been associated with the center. The following information is shown for each resource/type, as applicable: in service / out of service indicator, description, type, category, unit name, AVL vehicle, and camera. If a camera is associated, the system will allow the user to navigate to the camera's details page, the form used to display the camera on a monitor, and if applicable allow the camera to be displayed on the desktop.

8.8 Signals

8.8.1 **Signals Use Cases**

This diagram shows use cases related to the traffic signals feature where users can manage the association of traffic signals to action events and their display on the map.

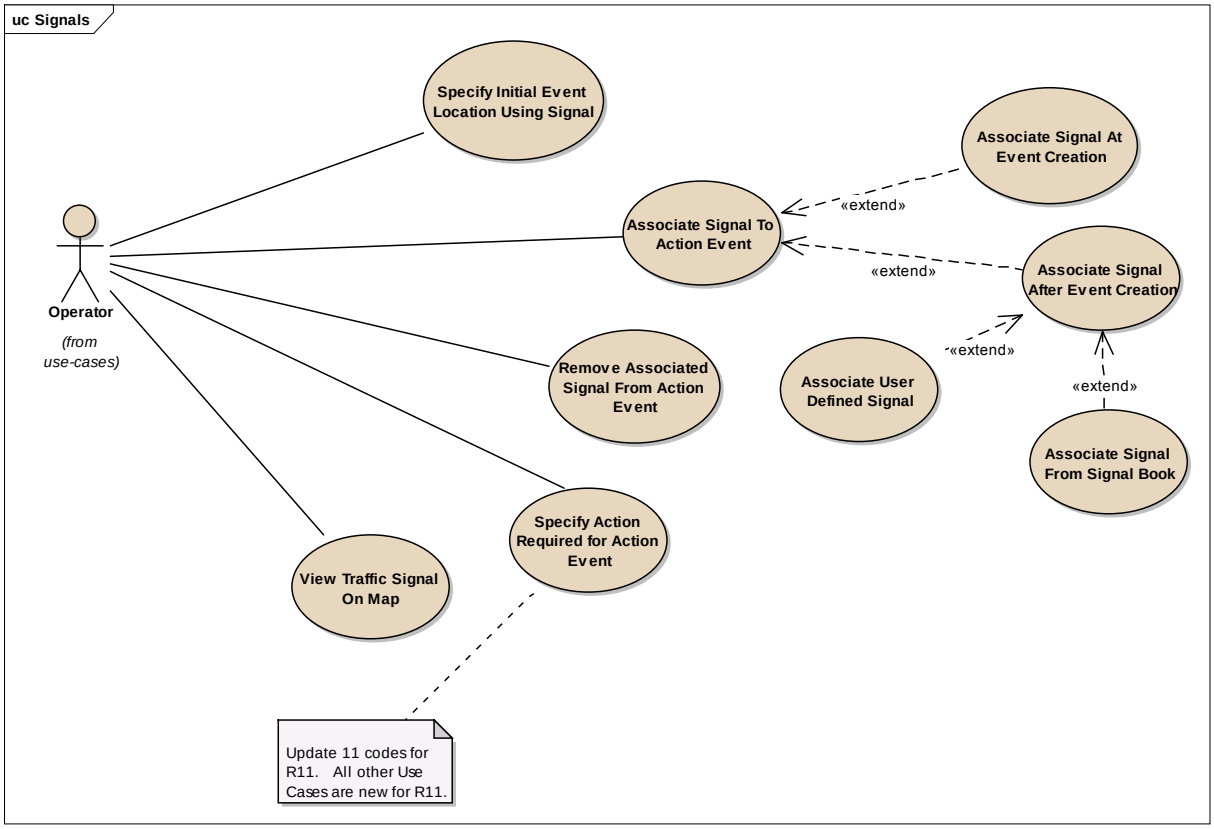


Figure 8-14 Signals

8.8.1.1 **Associate Signal After Event Creation**

A user may associate one or more traffic signals to an Action Event after creation.

8.8.1.2 **Associate Signal After Event Creation**

A user may associate a traffic signal to an Action Event at creation by using the signal to specify the location of the event on the create event page.

8.8.1.3 **Associate Signal From Signal Book**

A user may associate one or more traffic signals from the Signal Book to an action event after creation.

8.8.1.4 **Associate Signal To Action Event**

A user may associate one or more Traffic Signals to an Action Event.

8.8.1.5 **Associate User Defined Signal**

A user may associate one or more user defined traffic signals to an action event after creation by specifying a user defined signal name. This is to allow users to associate signals that are not currently known in the CHART system (new signal, signal data out of data, etc...).

8.8.1.6 **Remove Associated Signal From Action Event**

A user may remove (disassociate) a traffic signal from an action event from the event's details page.

8.8.1.7 **Specify Action Required for Action Event**

A user may specify Actions required for an action event from the event's details page. For R11 the following changes have been made for Action Types: Signal 11-13 has been removed, Signal 11_5RA (red arrow), Signal 11_5W (walk), and Signal 11_5DW (don't walk) have been added.

8.8.1.8 **Specify Initial Event Location Using Signal**

A user may use the location of a known Traffic Signal in CHART to specify the location of an event being created. The user can select a traffic signal map icon on the create event page and chose its location information to be used to fill the location fields on the page. This is primarily used for creating Signal related Action Events.

8.8.1.9 **View Action Event On Map**

A user will be able to see action event icons on the map. Different icons will be used to differentiate Action Events currently associated with Traffic Signals versus those not currently associated with Traffic Signals.

8.8.1.10 **View Traffic Signal On Map**

A user will be able to see traffic signal icons for known traffic signals in CHART on the Home Page Map and Specify Location Map. Traffic signals that are associated with an Action Event will appear on all map zoom levels and will have a red background. Traffic Signals currently associated with an Action Event will only appear on the lowest 2 zoom levels and will have a white background.

8.9 Traffic Event Management

8.9.1 Manage Traffic Event Participants

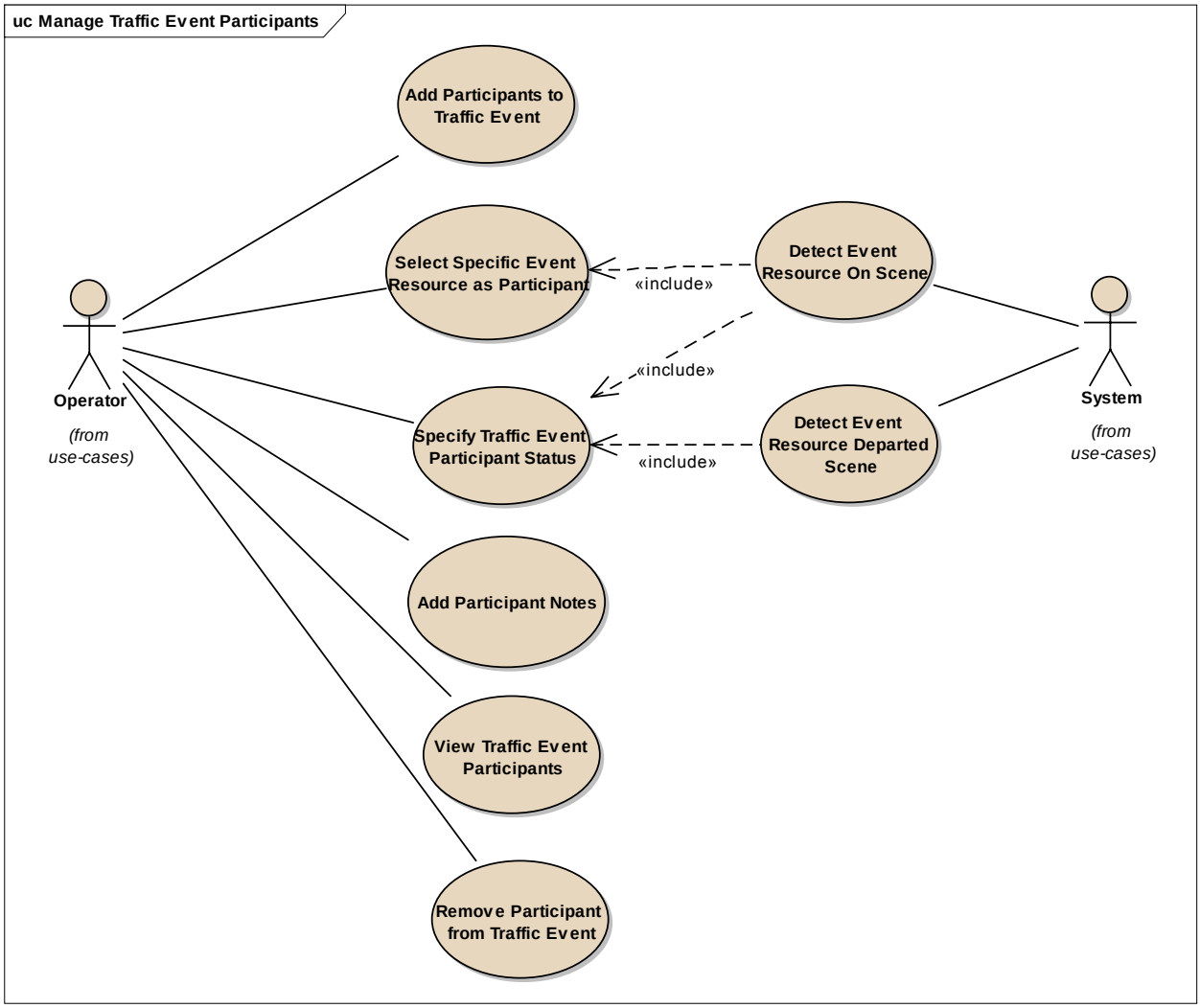


Figure 8-15 Manage Traffic Event Participants

8.9.1.1 Add Participant Notes

An operator with the manage traffic events right can add notes about a participant that has been added to a traffic event. These notes include the driver's call sign, driver first name, driver last name, and notes, all of which are separate fields, all of which are optional.

The system will log a message in the event history when notes are changed for a participant.

8.9.1.2 Add Participants to Traffic Event

A user with the manage traffic events right can add participants to the traffic event if the traffic event is an action event, disabled vehicle event, incident, special event, or weather service event. The list of candidates from which the user can choose includes those event resources and event resource types that have been associated with their operations center or the controlling operations

center for the traffic event (if the two are different). The user can enter a search string to filter the list of candidates before it is shown to allow them to select candidates. As the user types search text, a list of suggestions of candidates that meet their partial search string will be shown for selection. If they submit their search and it matches one and only one candidate, that event resource (or type) will be added to the traffic event without requiring the user to make a further selection. Otherwise the user will be presented with a form they can use to select one or more event resources or event resource types to be added as participants in the traffic event. The form will be filtered to include only those candidates that matched their search string. The user can also access this form directly without entering a search string.

The form that shows event resources and types that are candidates to be added to the traffic event as participants allows the user to select one or more candidates. For each candidate, the following information is shown: description, type, category, distance from event (if known), location description (if known), list of events to which the candidate is already assigned (if any), and an icon that represents the in service / out of service status (if applicable). For each traffic event shown, an indicator will be included to indicate if the candidate is on scene at that traffic event (marked as arrived/responded but not marked as departed).

The user can sort the list of candidates by description, type, category, or distance from the traffic event. The user can filter the list of candidates by type, category, and/or distance from the traffic event.

Due to the configurable nature of event resources and event resource types, the list of candidates can include agencies and non-agencies such as CHART / field units, special needs, and other resource types.

An entry will be made in the event history log when a participant is added to the traffic event.

8.9.1.3 **Detect Event Resource Arrived On Scene**

The system provides a feature that allows it to detect when a participant included in a traffic event that is an event resource with an associated AVL device is on the scene of the traffic event and mark the participant's arrived/responded flag automatically. The automatic on-scene detection can be enabled / disabled per traffic event, or system wide, as part of the group of features known as AVL Auto Detection. Additionally, if the user manually sets either the arrived/responded or departed flags for an individual participant in the traffic event, this feature is disabled for that participant. To determine if an event resource is on-scene, the system uses a radius around the traffic event location which is specified in the system profile.

8.9.1.4 **Detect Event Resource Departed Scene**

The system can detect if a participant that is marked arrived/responded has departed the scene, and set the departed flag automatically. This is possible when the participant is an event resource that is associated with an AVL device (and that AVL device is active). This feature must be enabled at the system level and traffic event level, as part of the group of features known as AVL Auto Detection. Also, the user must not have toggled the arrived/responded or departed flags for the participant manually. To determine if an event resource has departed the scene, the system detects if the location of the resource falls outside a circle around the traffic event's location, with the circle being defined by a system setting that specifies the radius of the circle used to detect scene departure.

8.9.1.5 Detect Specific Event Resource of Type

When a participant in the traffic event is an event resource type that is set to display the type name instead of individual units, the system can detect when a specific, unnamed event resource of that type is on-scene and replace the event resource type that was added by a user with the specific event resource of that type that is on-scene. To determine if an event resource is on-scene, the system uses a radius around the traffic event location which is specified in the system profile. This replacement of an event resource type with a specific event resource can only occur if the user has not entered any notes (call sign, driver name, or general notes) for that event participant. Additionally, the event resource must remain on-scene for a specific amount of time (configurable) before the system will make this replacement. This feature can be enabled / disabled per traffic event, or system wide, as part of the group of features known as AVL Auto Detection.

8.9.1.6 Remove Participant from Traffic Event

A user with the manage traffic events right can remove a participant from a traffic event. The system will add an entry in the traffic event history when a participant is removed.

8.9.1.7 Select Specific Event Resource as Participant

A user with the manage traffic event rights can select a specific resource to replace an event resource type that has been previously added as a participant in a traffic event. This is possible only when the event resource type is configured to show the type name instead of individual units and there are individual units of that type that do not have a unit name. This is also possible if the user (or system) has previously replaced the event resource type with a specific unit. In the case where a previously selected event resource is being replaced, the system will clear the arrived/responded and departed flags if they were set to automatic mode.

The system will log an entry in the event history when a specific event resource is selected to replace an event resource type or a previously selected specific event resource.

8.9.1.8 Specify Traffic Event Participant Status

A user with the manage traffic events right can specify the status of a participant that has been added to a traffic event. The user can indicate whether or not the participant has been notified, whether or not the participant has arrived/responded, and whether or not the participant has departed. When any of these flags get set to "true", the system will record the current date/time that the status became "true". The user can override the times recorded by the system. All status changes to participants will be logged in the event history.

This use case does not apply to pending events.

8.9.1.9 View Traffic Event Participants

The user can view the participants that have been added to a traffic event and their current status. The participant's description will be shown, including any notes that have been entered about the participant such as the driver's call sign, driver first name, driver last name, or general notes. An indicator will be shown if the participant is an event resource that was automatically selected by the system to replace a generic system resource type that was added by a user.

For each of the notified, arrived/responded, and departed flags, if set to true the system will show the time at which the flag was changed to true (or the time as edited by the user). When the flag is false, indicators will show if the arrived/responded and departed flags can be set automatically by the system (based on automatic on-scene / departed scene detection) or whether the flags must be set manually by the user (which is the case if the event resource does not support AVL, the user has previously set either of these flags manually, or if the automatic on-scene / departed scene feature is turned off for the traffic event or system wide).

8.9.2 Traffic Event Management

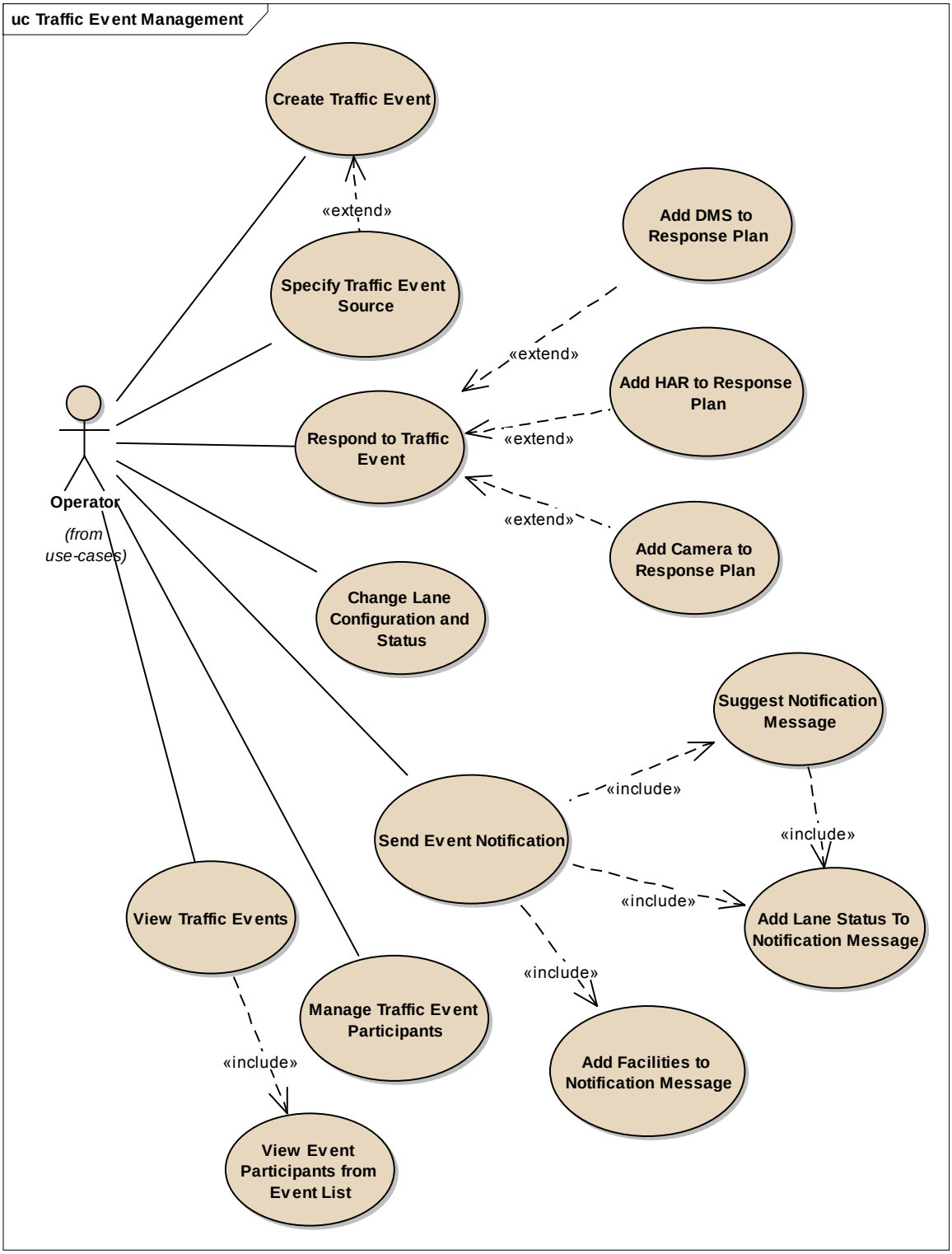


Figure 8-16 Traffic Event Management

8.9.2.1 **Add Camera to Response Plan**

An operator with the correct functional rights may add a camera to the response plan of a traffic event. Doing so will cause the camera to be added to the video tour in the response plan. A camera can be added to the response plan either as the result of requesting suggestions (i.e. via decision support) or by selecting from a list of cameras in the system. Using decision support, an operator may add a camera to the plan. A user may also select a camera from a list of cameras in the system. The list will be sorted by the distance of the camera from the traffic event. The selected camera will be added to the video tour in the response plan which the operator may modify before executing the tour.

8.9.2.2 **Add DMS to Response Plan**

An operator with the correct functional rights may add a DMS to the response plan of a traffic event. Doing so will cause the message to be set on that DMS when the response plan is executed. A DMS can be added to the response plan either as the result of requesting suggestions (i.e. via decision support) or by selecting from a list of DMSs in the system. Using decision support, an operator may add a DMS with a preconfigured message to the plan. A user may also select a DMS from a list of DMSs in the system. The list will be sorted by the distance of the DMS from the traffic event. The selected DMS will be added to the plan with a blank initial message which the operator may modify before executing the plan.

8.9.2.3 **Add Facilities to Notification Message**

An operator should be able to quickly add a responsible facility to an event notification from a pre-configured list of facilities shortcuts. Facilities will be configurable under General Notification properties in the system profile.

8.9.2.4 **Add HAR to Response Plan**

An operator with the correct functional rights may add a HAR to the response plan of a traffic event. Doing so will cause the message to be set on that HAR when the response plan is executed. A HAR can be added to the response plan either as the result of requesting suggestions (i.e. via decision support) or by selecting from a list of HARs in the system. Using decision support, an operator may add a HAR with a preconfigured message to the plan. A user may also select a HAR from a list of HARs in the system. The list will be sorted by the distance of the HAR from the traffic event. The selected HAR will be added to the plan with a blank initial message which the operator may modify before executing the plan.

8.9.2.5 **Add Lane Status To Notification Message**

An operator should be able to add lane status information to represent the travel lane state of the roadway with regards to the event. The lane status message should be efficient with regards to character consumption, as devices receiving notifications have a small character limit.

If any lanes are closed between the left and right shoulder, the description will include "Center Lane Closed", or "Center Lanes Closed". If the far left or right lane is closed, the description will include "Left Lane Closed", or "Right Lane Closed". If more than one far left or far right

lane is closed, the number of closed lanes will be included. If non contiguous lanes are closed that cannot be grouped by a lane type, the number of closed lanes will be shown.

Only travel lanes will be included in the lane status description. Shoulders and medians will not be included, regardless of their status.

Lanes closed in the direction of the traffic event will be listed first, followed by any lanes closed in the opposite direction.

The direction of lane closures will not be included in the description unless lanes are closed in both directions.

Abbreviations defined in the system profile can be utilized to reduce the length of the notification message. Abbreviations are defined for directions, lane types, and lane positions. Abbreviations should also be defined or the condition of all lanes open or all lanes closed.

8.9.2.6 Change Lane Configuration and Status

An operator with the manage traffic events user right may edit the lane status of a traffic event, including changing direction for a particular lane. This only applies to open Planned Roadway Closures, Incidents, and Special Events. When the lane configuration and status is updated, the user will be reminded to updated response suggestions.

8.9.2.7 Create Traffic Event

A user with the manage traffic events right can create a new traffic event from a form present on their home page. This includes specifying the event's location and type, as well as several optional fields such as the event source, tag info (for a disabled vehicle event), etc.

8.9.2.8 Manage Traffic Event Participants

A user with the manage traffic events right can manage the participants assigned to a traffic event. See the Manage Traffic Event Participants use case diagram for details.

8.9.2.9 Respond to Traffic Event

The system allows an operator to control devices in response to an event through the use of a response plan. The user may add devices to the plan, select the desired state of the devices, then activate the plan. Any of the devices used by the event response plan may be deactivated while the event is open by removing the item for that device from the plan. When the event is closed, if the response plan is active, it will be deactivated automatically.

8.9.2.10 Send Event Notification

An operator with the send notification right, can create a notification from within the context of a traffic event. The notification should contain details about the event including the event type, location, and roadway details.

An operator should be able to generate the notification message using any combination of the message suggestion feature, quick links, and manual editing. The current cursor position should always be used when using the links for updating the message. The exception to this rule is that the update link should pre-pend "Update: " to the message.

Depending on the status of the event and prior notifications, links should exist for adding the prior message, location, vehicles involved, lane status, HAZMAT, scene status, or text indicating the notification is an update.

For an operator to send a notification, their initials must be specified.

8.9.2.11 **Specify Traffic Event Source**

The user can specify the source of the traffic event.

- If the user selects a source type of "Field Unit", the system will allow the user to select a specific field unit from the list of field units on their home page. The system will include a type ahead feature to assist in finding the specific field unit. When the user creates the event, if the traffic event type supports participants and a specific participant was chosen, or if the type ahead text matches exactly one field unit in the list of the op center's field units, that field unit will be added as a participant in the event, its notified status will be set to true, and the notified time will be set to the time the event is created.
- If the user selects a source type other than "Field Unit", the system will allow them to enter free form text to identify the source name.

8.9.2.12 **Suggest Notification Message**

An operator is encouraged to use the suggestion generation capability when sending an event notification. The suggestion includes information about the event type, location, roadway details, scene status, and queue length.

8.9.2.13 **View Event Participants from Event List**

When viewing an event list, the user can view the number of participants assigned to the event and optionally view a list of the participants.

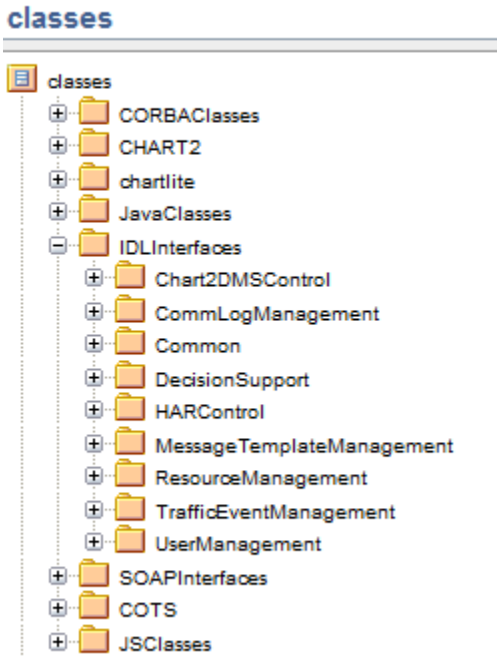
For each participant, the status of each of their notified, arrived/responded, and departed flags is shown, including an indicator that shows if the arrived/responded and departed flags are in auto-mode (where they will get set automatically based on AVL data if possible). If the user has the right to manage traffic events, they can toggle any of these flags. The user can also launch the form used to add participants to the event, including the ability to provide search text prior to displaying the form.

8.9.2.14 **View Traffic Events**

The system allows the user to view a list of open and closed traffic events that exist in the system.

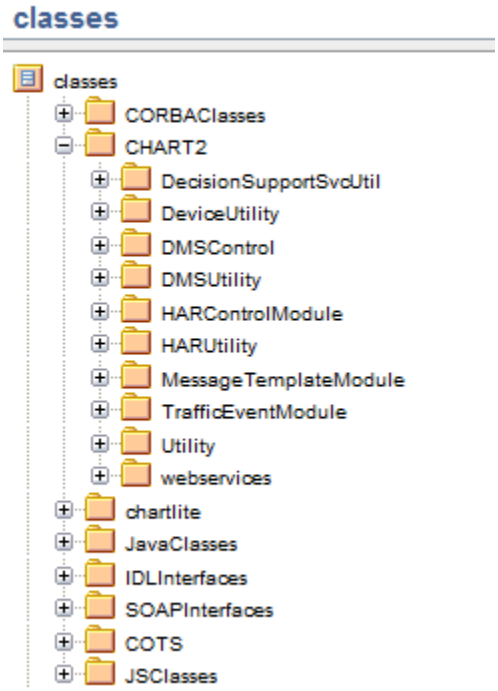
9 System Interfaces Design (IDL)

For convenient viewing, new and modified IDL designs are included in a separate document for viewing with a browser. See the example below for where to find links to the classes -> IDLInterfaces diagrams.



10 Package Designs

For convenient viewing, new and modified package designs are included in a separate document for viewing with a browser. See the example below for where to find links to the classes -> CHART2 diagrams.



11 Appendices

11.1 Appendix A. HAR Lane Closure Description Generation

The following flowchart describes the logic used to create the Lane Closure Description string used for CHART Decision Support HAR Message Suggestion functionality. The logic is described is requirement 4.2.3.2.1.2.11.1.1.4.3 and its children.

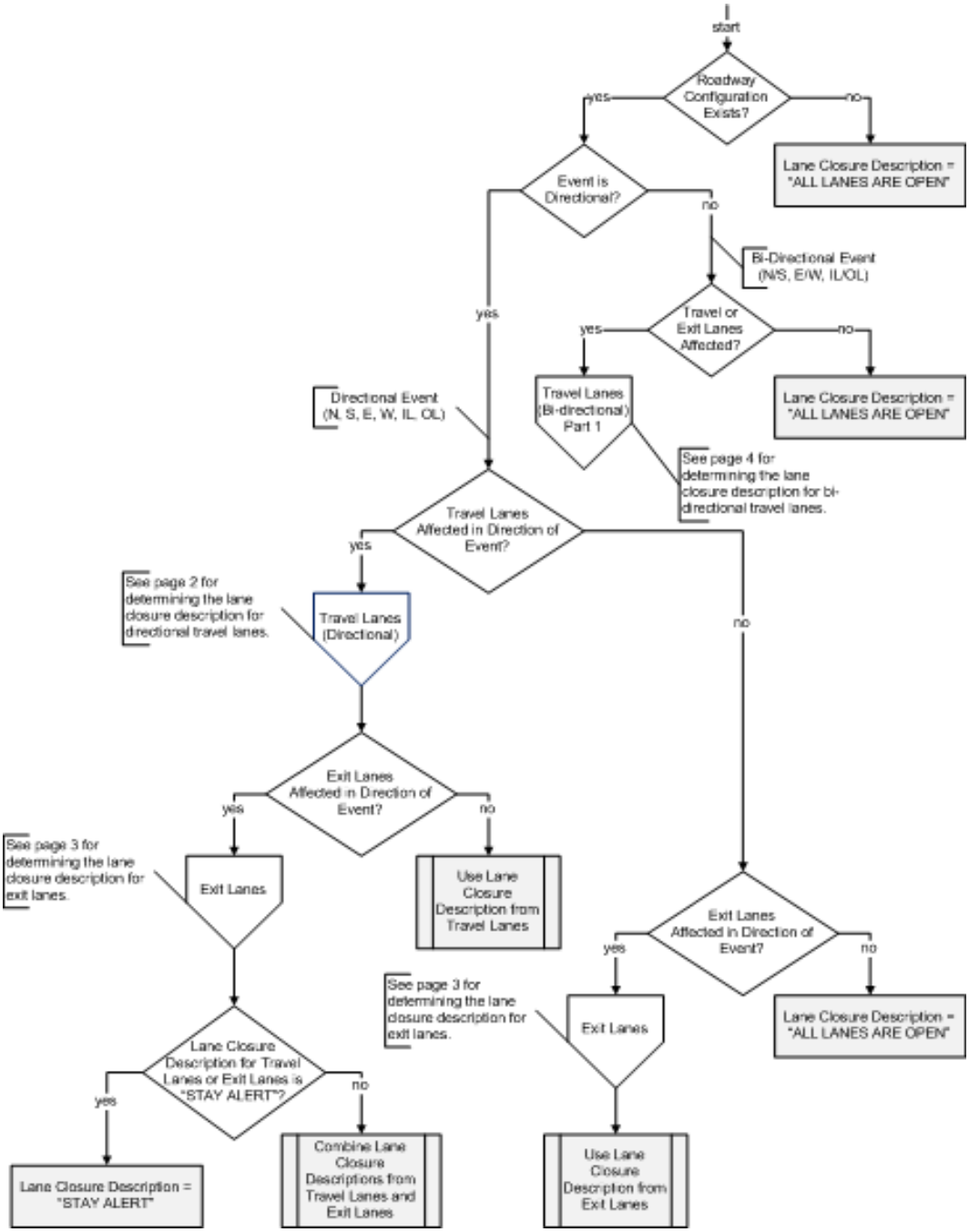


Figure 11-1. Generating Lane Configuration Descriptions for HARs.

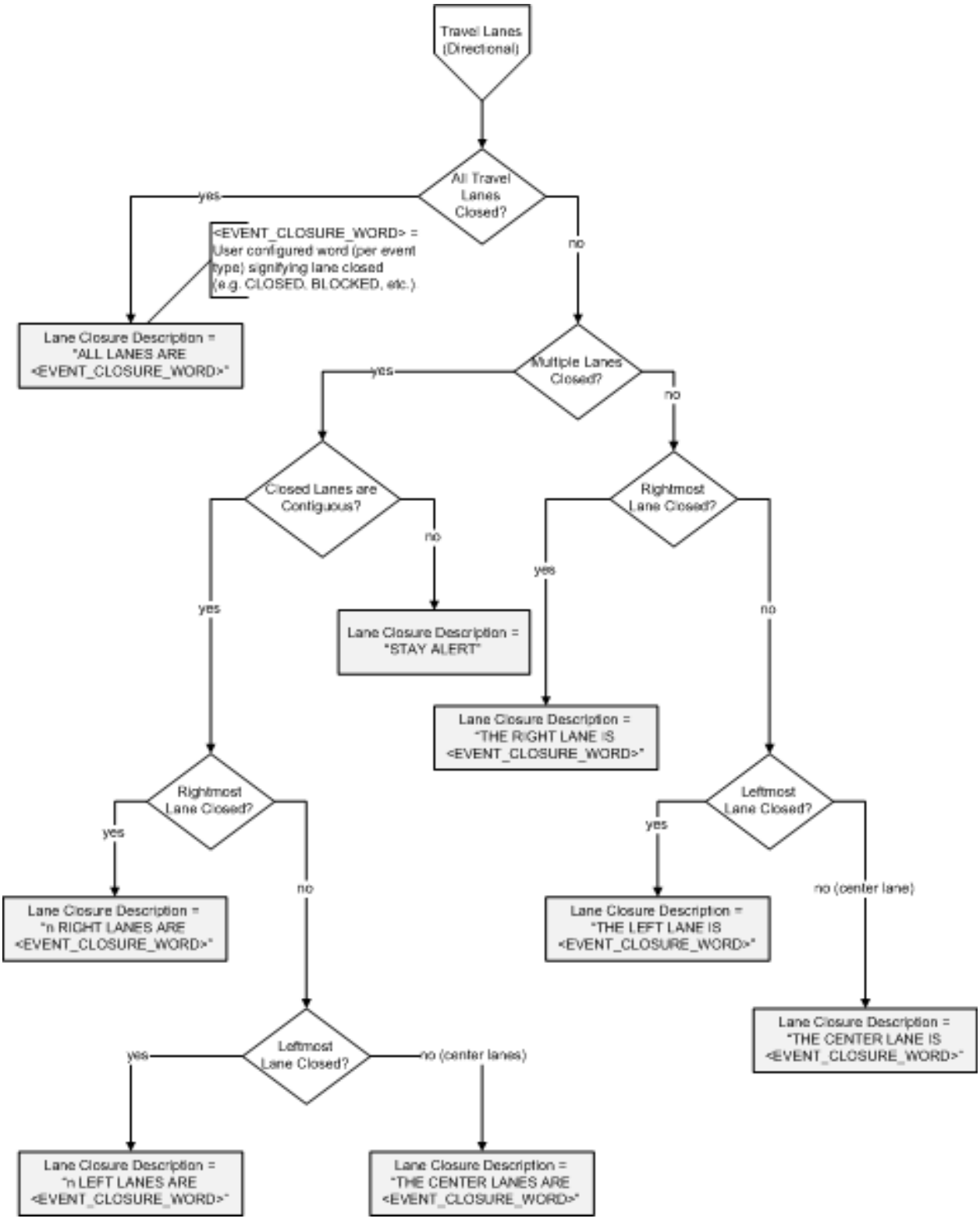


Figure 11-2. Generating Travel Lane Configuration Descriptions for HARs.

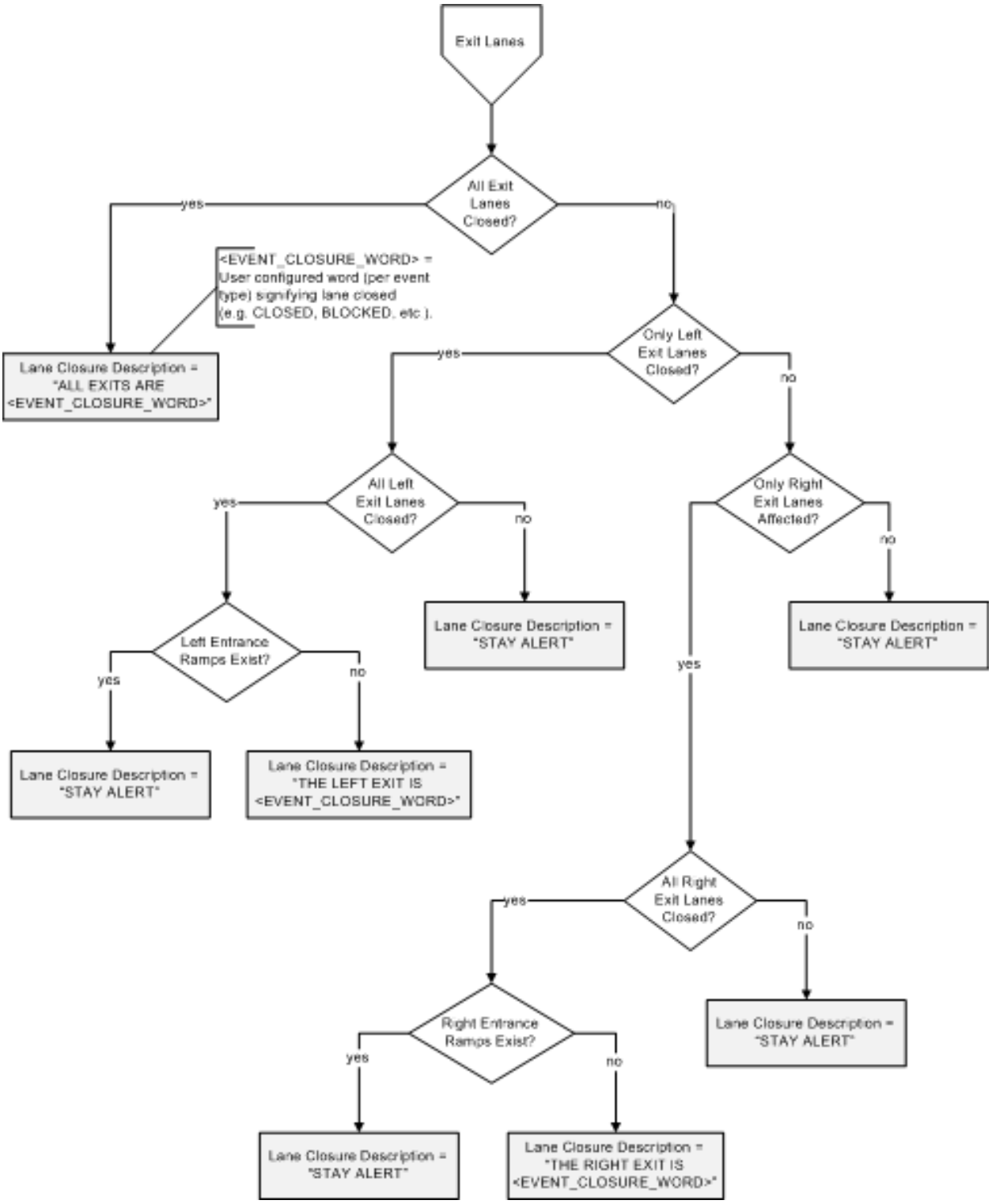


Figure 11-3. Generating Exit Lane Configuration Descriptions for HARs.

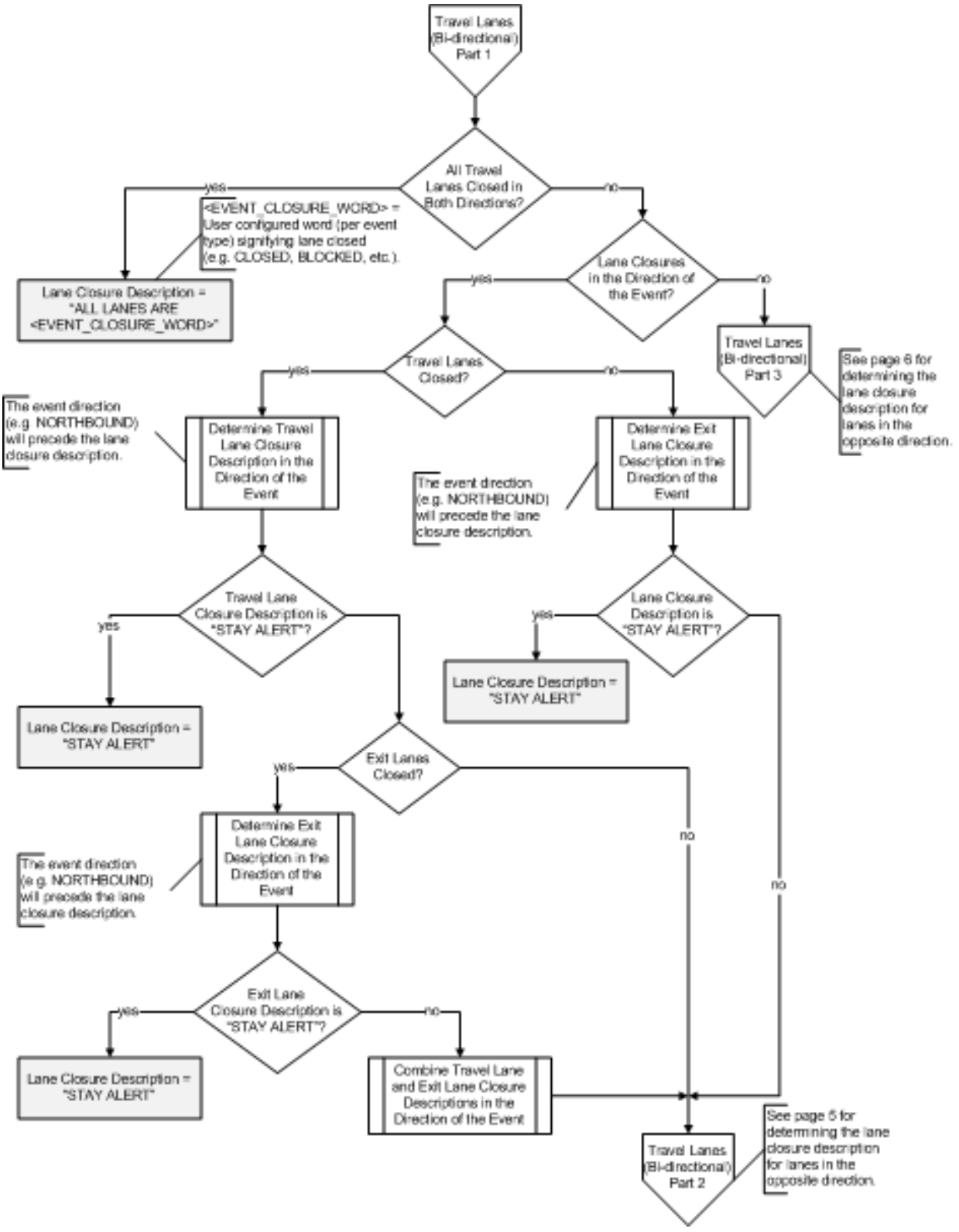


Figure 11-4. Generating Bi-directional Travel Lane Configuration Descriptions for HARs in the Direction of the Event.

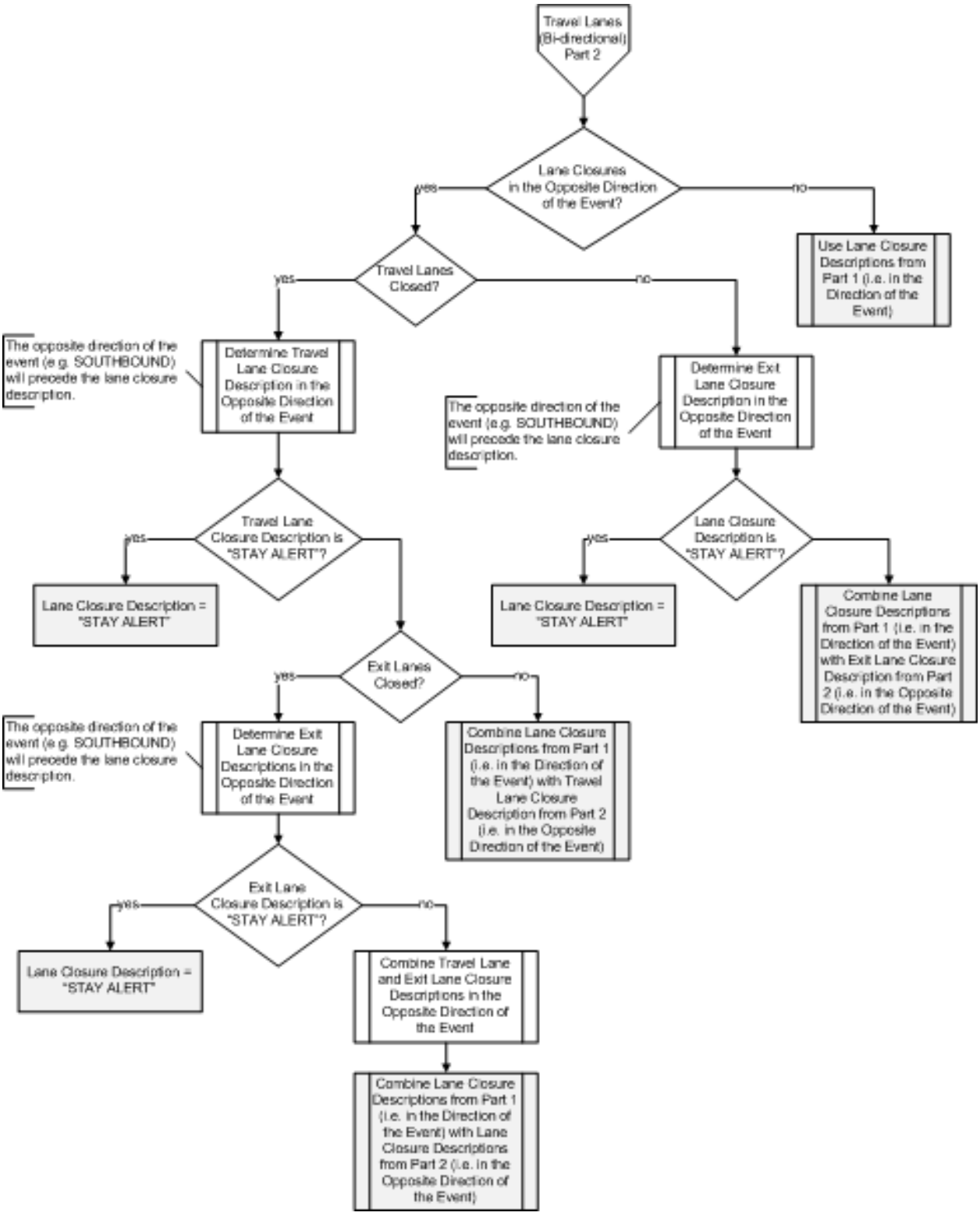


Figure 11-5. Generating Bi-directional Travel Lane Configuration Descriptions for HARs in the Opposite Direction of the Event Following Descriptions in the Direction of the Event.

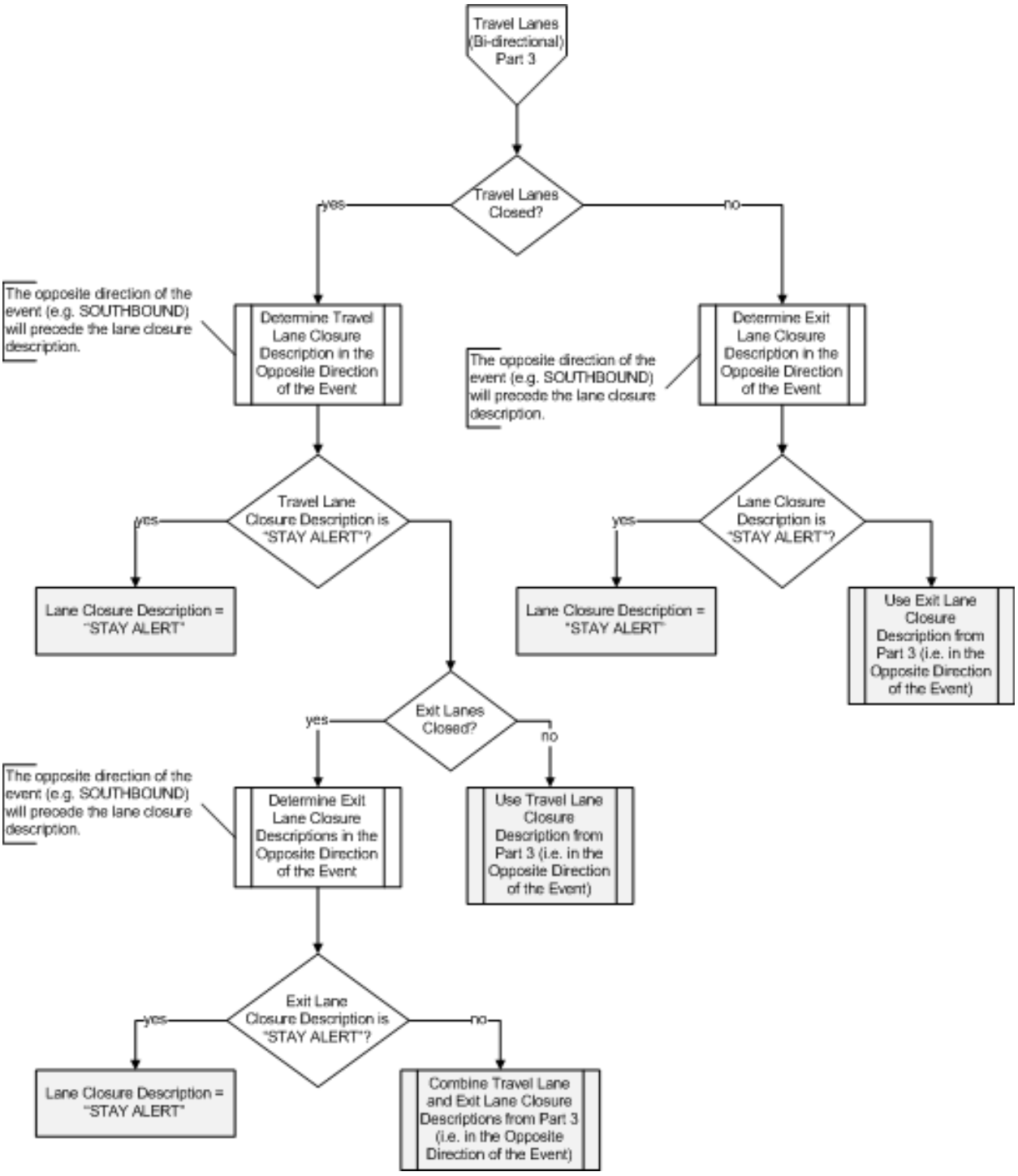


Figure 11-6. Generating Bi-directional Travel Lane Configuration Descriptions for HARs in the Opposite Direction of the Event.